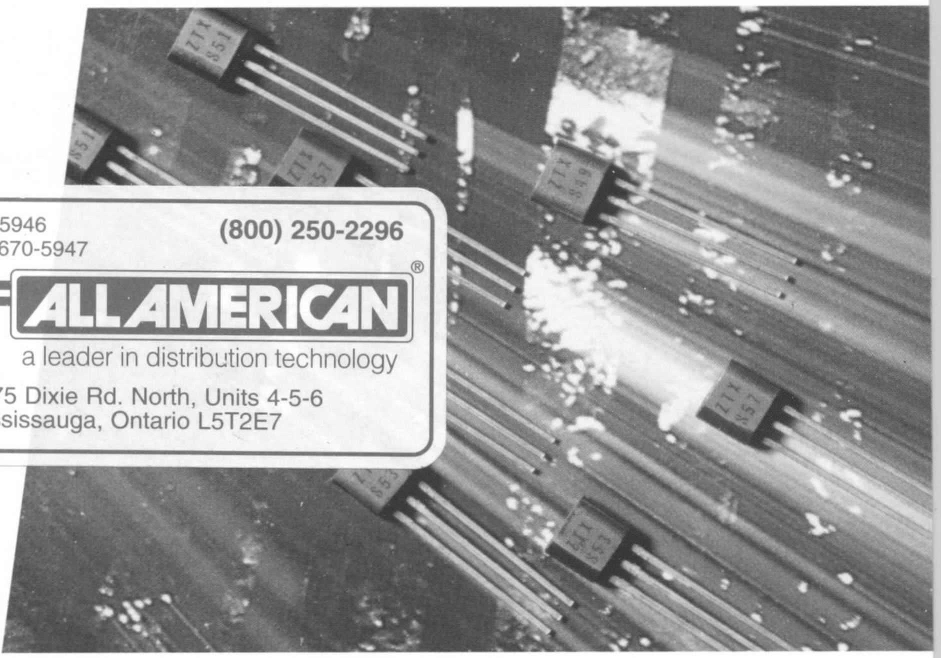
Semiconductor Data Book



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Book 1 Through Hole Components

- *Bipolar Transistors*
- *Diodes*
- *MOSFETs*
- *References and Regulators*

ZETEX

Book 1 Through Hole Components

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Book 2 Surface Mount Components – Available on Request

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Zetex plc

Zetex boasts a remarkable pedigree in the manufacture of analogue components. For over thirty years, innovation and excellence have been our hallmarks and a succession of world firsts characterise the company's record.

Today, through a commitment to Total Quality Management and to the provision of a first class service, Zetex has established itself as the preferred vendor to thousands of companies around the world.

Through a Zero Defect production programme and a technical support service which is second-to-none, customers requiring small quantity, high specification components can expect the same attentive care as those making high volume demands.

Inherently designed-in product quality is supported by SPC, ESD, FMEA and PPM programs on all product lines, whilst Delivery On Time remains a central objective.

It is no surprise, then, that the trust and respect of customers have set Zetex apart from its competitors. Product specification, and an outstanding record of reliability has ensured that "customer satisfaction" is a consistent feature of Zetex's performance.

Today, Zetex can boast an international network of expertise, offering technical support to specialist manufacturers all over the world.

An outstanding service. Performance you can trust.

Quality Approvals

Zetex has demonstrated during extensive audits that all areas of its quality system have met the requirements laid down by international bodies.

BS EN ISO 9001 - International specifications for design development, production, installation and servicing.

BS9000 - British component approvals.

CECC 50000 - European component approvals.

IECQ 700000 - International component approvals.

Zetex has also been awarded many individual component approvals by major companies throughout the world.

Product Reliability

The reliability of Zetex product is ensured by a Qualification Program and an on-going Product Reliability Monitoring Program.

The Qualification Program is used to prove the reliability of new devices and packages whilst the Product Reliability Monitoring Program is designed to continually assess the reliability of all Zetex products by randomly selecting them (against a pre-defined program) from the production line.

The programs call up a series of environmental stress tests as detailed below.

Test	Test Conditions
High Temperature Reverse Bias (HTRB)	V_{CB}=80% × $V_{CE(MAX)}$, T=200°C (Eline) T=150°C (Others)
Steady State Operating Life	V_{CE}=$V_{CE(MAX)}$, P=$P_{(MAX)}$
Dry Heat Storage	T=200°C (Eline), 150°C (Others)
Temperature Cycling	T=-55°C (30 mins) 3 min change to 150°C (30 mins)
Bias Humidity Test	85°C – 85% RH – 85% Reverse Bias

Further details and results are available on request.

Selection Guide

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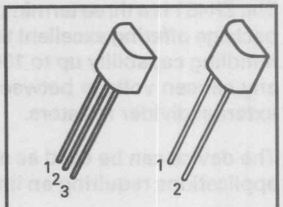
Voltage References and Regulators

Voltage References

Zetex range of voltage reference devices uses a bandgap circuit design to achieve precision micropower voltage references. The designs provide a stable voltage without an external capacitor and are stable with capacitive loads.



E-Line
TO92 Compatible

The rugged designs and 20 volt processing allows the devices to withstand transient effects and currents up to 200 mA. Superior switching capability allows the device to reach stable operating conditions in only a few microseconds.

The devices are ideally suited for use in:

- * Battery powered and portable equipment
- * Metering and measurement systems
- * Instrumentation
- * Test equipment
- * Data acquisition systems
- * Precision power supplies

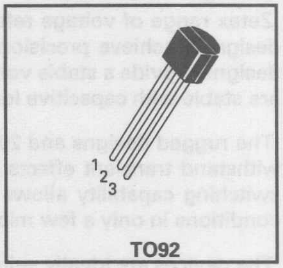
PART NO.	Nominal Voltage V #	Guaranteed Knee Current µA	Maximum Slope Resistance Ω	Maximum Temperature Coefficient PPM/°C	PIN OUT 1	2	3
3 PIN DEVICE							
ZRB500A	5	50	1	50	substrate	V_{REF}	0V
ZRA400A	4.096	50	2	50	substrate	V_{REF}	0V
ZRC330A	3.3	20	2	50	substrate	V_{REF}	0V
ZRA250A	2.5	50	2	90	substrate	V_{REF}	0V
ZRA245A	2.45	2000	0.5	50	substrate	V_{REF}	0V
ZRA125A	1.25	50	2	90	substrate	V_{REF}	0V
ZRA124A	1.24	50	2	90	substrate	V_{REF}	0V
2 PIN DEVICE							
ZRB500Y	5	50	1	50	0V	V_{REF}	-
ZRA400Y	4.096	50	2	50	0V	V_{REF}	-
ZRC330Y	3.3	20	2	50	0V	V_{REF}	-
ZRA250Y	2.5	50	2	90	0V	V_{REF}	-
ZRA245Y	2.45	2000	0.5	50	0V	V_{REF}	-
ZRA125Y	1.25	50	2	90	0V	V_{REF}	-
ZRA124Y	1.24	50	2	90	0V	V_{REF}	

#Available with 1%(suffix 01), 2%(suffix 02) and 3%(suffix 03) tolerances

Voltage References and Regulators

Adjustable Precision Zener Shunt Regulator

The ZR431 is a three terminal adjustable shunt regulator in the TO92 package offering excellent temperature stability and output current handling capability up to 100mA. The output voltage may be set to any chosen voltage between 2.5 and 20 volts by selection of two external divider resistors.



TO92

The device can be used as a replacement for zener diodes in many applications requiring an improvement in zener performance.

Typical applications are:

Shunt regulator
Series regulator
Voltage monitor
Over / under voltage protection
Switch mode power supplies

PART NO.	Regulator Voltage Range V	Minimum Shunt Current to Maintain Reg µA	Tolerance %	Typical Temperature Coefficient ppm / °C	PIN OUT 1 2 3
ZR431C	2.5 to 20	35	2	50	V_{REF} G_{ND} V_Z

Fixed Positive Local Voltage Regulators

The ZSR Series three terminal fixed positive voltage regulators, in the TO92 package, feature internal current limit and thermal shutdown making the devices almost impossible to destroy. The circuit design allows creation of any custom voltage in the range 3 to 10 volts.

The devices are useable in local voltage regulation applications, where problems can be encountered with distributed single source regulation as well as more general voltage regulation applications.

The ZSR Series show performance characteristics superior to other local voltage regulators. The initial output voltage is maintained to within 2.5 % with a quiescent current of typically 350 µA. Output voltage change, with input voltage and load current, is much lower than competitive devices. The ZSR devices are completely stable with no external components. The devices will shut down under thermal overload conditions but as the device cools, regulation will restart until thermal overload reoccurs.

PART NO.	Output Voltage V	Output Voltage Tolerance %	Typical Differential Voltage V	PIN OUT 1 2 3
ZSR1000C	10	2.5	1.7	OUT G_{ND} IN
ZSR800C	8	2.5	1.7	OUT G_{ND} IN
ZSR600C	6	2.5	1.7	OUT G_{ND} IN
ZSR500C	5	2.5	1.7	OUT G_{ND} IN
ZSR330C	3.3	2.5	1.7	OUT G_{ND} IN

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E-Line Bipolar Transistors

Design Features

The Zetex E-Line range of complementary NPN and PNP transistors brings together advanced chip technology and assembly techniques to give superior performance in a TO-92 style package. Parallel studies into chip design and assembly techniques have combined to produce the outstanding features of the E-Line product range.

The Zetex E-Line package has built a reputation for its reliability and advanced design. A major study of eutectic die attach techniques produced void free die attach to give improved thermal and electrical characteristics.

High Dissipation

The improved chip construction together with void free die attach and plastic encapsulant has given a device with a true 1W dissipation at room temperature (25°C), this allows a practical power dissipation of up to 1.5W when the collector lead is soldered to an equivalent of 1 square inch of copper. An in-depth study of heat sink techniques in conjunction with the E-Line package has shown that up to 2.5W can be handled.

Environmental Protection

The plastic used for the Zetex E-Line encapsulation protects the active semiconductor chip from exposure to corrosive agents, moisture and extreme environmental conditions.

The absence of ionic contamination in the plastic allows chip operation up to 200°C without risk of failure. In regular tests conducted by the Zetex Reliability Group, E-Line devices are operated at T_{amb}=230°C under reverse bias conditions. All devices must survive without degradation. This permits the wide operating and storage temperature range normally associated only with metal-can devices.

High Current Gain

A major objective of the chip design was to produce a transistor with improved gain properties at high current levels. By utilising advanced power efficient geometries and diffusion techniques, minimum gains of 400 have been achieved at collector currents of 3A.

Low Saturation Voltage

Improvements in high current gain performance and in every aspect of device saturation resistances, together with improved die attach techniques, have combined to give an extremely low $V_{CE(sat)}$ specification.

Complimentary Pairs

Selective chip design has produced NPN and PNP transistors with excellent gain linearity, ideal for applications requiring complimentary drivers.

E-Line Bipolar Transistors

High Current Handling Capability

Improvements in equalising current distribution across the chip (avoiding "hot spots") has produced a continuous current (I_C) rating of 5A and peak pulse currents (I_{CM}) of 20A. This makes the ZTX650, 750, 850 and 950 series ideal for applications such as solenoid, actuators,relays, lamp drivers, motor drivers and photo flash units.

Fast Switching – High f_T

The planar epitaxial construction gives inherently fast switching speeds - 25ns turn on time at I_C=500mA and high f_T - typically 175MHz for the ZTX650 and 140MHz for the ZTX750 at 100MHz.

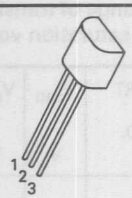
The Result – More Power From E-Line

The Zetex E-Line package gives performance and reliability beyond standard TO92 products and is comparable with TO126 and TO220 devices in free standing applications.

Ambient Temp. (°C)	Power Dissipation (mW)			
	E-Line	TO92	TO126	TO220
25	1000	800	1500	2000
50	870	640	1200	1600
100	570	320	600	800
125	429	160	300	400
150	285	Zero	Zero	Zero
200	Zero	Zero	Zero	Zero

Performance

As a result of the design features described, Zetex E-Line transistors out perform similar types of plastic transistors. In addition to the wide range of industry standard types, Zetex has produced the following ranges that fully exploit the unique features of E-Line.



E-Line
TO92 Compatible

High Current Transistors (P_D=1.2 Watts)

This range of devices is rated at 1.2 Watts and offers extremely low saturation voltages coupled with high continuous and pulsed current capability. Typical application areas to benefit from these products are emergency lighting, notebook computer power supplies, automotive circuits and flash gun converters.

PART	V_{CBO}	V_{CEO}	I_C	I_{CM}	$V_{CE(sat)}$ max @			h_{FE} min @			h_{FE} min @			f_T typ @		PIN
NO.	V	V	A	A	V	I_C A	I_B mA		I_C A	V_{CE} V		I_C A	V_{CE} V	MHz	I_C mA	OUT 123
NPN																
ZTX857	330	300	3	5	0.25	3	600	100	0.5	10	15	2	10	80	100	CBE
ZTX855	250	150	4	10	0.26	4	400	100	1.0	5	35	4	5	90	100	CBE
ZTX853	200	100	4	10	0.20	4	400	100	2.0	2	20	10	2	130	100	CBE
ZTX851	150	60	5	20	0.25	5	200	100	2.0	1	25	10	1	130	100	CBE
ZTX849	80	30	5	20	0.22	5	200	100	1.0	1	30	20	1	100	100	CBE
ZTX869	60	25	5	20	0.22	5	100	300	1.0	1	40	20	1	100	100	CBE
PNP																
ZTX958	-400	-400	-0.5	-1.5	-0.40	-0.5	-100	100	-0.5	-10	10	-1	-10	85	-100	CBE
ZTX957	-330	-300	-1	-2	-0.20	-1	-300	100	-0.5	-10	90	-1	-10	85	-100	CBE
ZTX956	-220	-200	-2	-5	-0.25	-2	-400	100	-1.0	-5	50	-2	-5	110	-100	CBE
ZTX955	-180	-140	-3	-10	-0.33	-3	-300	100	-1.0	-5	75	-3	-5	110	-100	CBE
ZTX953	-140	-100	-3.5	-10	-0.33	-4	-400	100	-1.0	-1	30	-4	-1	125	-100	CBE
ZTX951	-100	-60	-4	-15	-0.30	-4	-400	100	-1.0	-1	10	-10	-1	120	-100	CBE
ZTX949	-50	-30	-4.5	-20	-0.32	-5	-300	100	-1.0	-1	75	-5	-1	100	-100	CBE
ZTX948	-40	-20	-4.5	-20	-0.31	-5	-300	100	-1.0	-1	15	-20	-1	80	-100	CBE
ZTX968	-15	-12	-4.5	-20	-0.30	-5	-200	300	-0.5	-1	150	-10	-1	80	-100	CBE

E-Line Bipolar Transistors

High Gain E–Line Transistors (P_D=1 Watt)

This range of transistors is an extension of the E-Line range offering high gain whilst maintaining a low saturation voltage.

PART NO.	V_{CBO} V	V_{CEO} V	I_C A	I_{CM} A	$V_{CE(sat)}$ max @ V	I_C A	I_B mA	h_{FE} min @	I_C mA	V_{CE} V	hFE min @	I_C A	VCE V	f_T min @ MHz	I_C mA	PIN OUT 123
NPN																
ZTX696B	180	180	0.5	1	0.25	0.2	5	500	100	5	150	0.2	5	70	50	CBE
ZTX1056A	200	160	3.0	6	0.30	3.0	200	300	500	10	30	3.0	10	120‡	50	CBE
ZTX1055A	175	120	3.0	6	0.31	3.0	150	300	1000	10	50	3.0	10	130‡	50	CBE
ZTX694B	120	120	0.5	1	0.50	0.4	5	400	200	2	150	0.4	2	130	50	CBE
ZTX1053A	150	75	3.0	10	0.25	3.0	100	300	1000	2	100	3.0	2	140‡	50	CBE
ZTX692B	70	70	1.0	2	0.50	1.0	10	400	500	2	150	1.0	2	150	50	CBE
ZTX1051A	150	40	4.0	10	0.21	4.0	100	300	1000	2	190	4.0	2	155‡	50	CBE
ZTX690B	45	45	2.0	6	0.5	1.0	5	400	1000	2	150	2.0	2	150	50	CBE
FXT690B	45	45	2.0	6	0.5	1.0	5	400	1000	2	150	2.0	2	150	50	BCE
ZTX1049A	80	30	4.0	15	0.245	4.0	50	300	1000	2	50	15	2	100‡	50	CBE
ZTX689B	20	20	3.0	8	0.5	2.0	10	400	2000	2	150	6.0	2	150	50	CBE
ZTX1048A	50	17.5	4.0	20	0.245	4.0	20	300	1000	2	50	20.0	2	150‡	50	CBE
ZTX688B	12	12	3.0	10	0.35	3.0	20	400	3000	2	100	10.0	2	150	50	CBE
FXT688B	12	12	3.0	10	0.35	3.0	20	400	3000	2	100	10.0	2	150	50	BCE
ZTX1047A	35	10	4.0	20	0.19	4.0	20	300	1000	2	60	20.0	2	150‡	50	CBE
PNP																
ZTX796A	-200	-200	-0.5	-1	-0.3	-0.2	-20	300	-100	-10	100	-0.4	-10	100	-50	CBE
ZTX795A	-140	-140	-0.5	-1	-0.3	-0.2	-5	250	-200	-2	100	-0.3	-2	100	-50	CBE
ZTX792A	-75	-70	-2	-4	-0.5	-1.0	-25	250	-500	-2	200	-1	-2	100	-50	CBE
ZTX790A	-50	-40	-2	-6	-0.75	-2.0	-50	200	-1000	-2	150	-2	-2	100	-50	CBE
FXT790A	-50	-40	-2	-6	-0.75	-2.0	-50	200	-1000	-2	150	-2	-2	100	-50	BCE
ZTX789A	-25	-25	-3	-8	-0.45	-2.0	-20	200	-2000	-2	100	-6	-2	100	-50	CBE
ZTX788A	-20	-15	-3	-10	-0.32	-2.0	-20	200	-2000	-1	80	-10	-2	100	-50	CBE
ZTX788B	-15	-15	-3	-8	-0.45	-2.0	-10	300	-2000	-2	150	-6	-2	100	-50	CBE
FXT788B	-15	-15	-3	-8	-0.45	-2.0	-10	300	-2000	-2	150	-6	-2	100	-50	BCE

‡Typical Values

E-Line Bipolar Transistors

High Performance Transistors (P_D=1 Watt)

This range of transistors is rated at 1 Watt and the low saturation voltage and high pulsed current rating make them ideal for use in audio , automotive and telecoms circuits.

PART NO.	V_{CBO} V	V_{CEO} V	I_C A	I_{CM} A	$V_{CE(sat)}$ max @ V	I_C A	I_B A	h_{FE} min @	I_C A	V_{CE} V	h_{FE} min @	I_C A	V_{CE} V	f_T min @ MHz	I_C mA	PIN OUT 123
NPN																
ZTX658	400	400	0.5	1	0.5	0.1	0.01	50	0.1	5	40	0.2	10	50	20	CBE
ZTX657	300	300	0.5	1	0.5	0.1	0.01	40	0.01	5	50	0.1	5	30	10	CBE
FXT657	300	300	0.5	1	0.5	0.1	0.01	40	0.01	5	50	0.1	5	30	10	BCE
ZTX656	200	200	0.5	1	0.5	0.1	0.01	40	0.01	5	50	0.1	5	30	10	CBE
ZTX655	150	150	1	2	0.5	1	0.2	50	0.5	5	20	1	5	30	10	CBE
FXT655	150	150	1	2	0.5	1	0.2	50	0.5	5	20	1	5	30	10	BCE
ZTX654	125	125	1	2	0.5	1	0.2	50	0.5	5	20	1	5	30	10	CBE
ZTX653	120	100	2	6	0.5	2	0.2	100	0.5	2	25	2	2	140	100	CBE
FXT653	120	100	2	6	0.5	2	0.2	100	0.5	2	25	2	2	140	100	BCE
ZTX652	100	80	2	6	0.5	2	0.2	100	0.5	2	25	2	2	140	100	CBE
ZTX651	80	60	2	6	0.5	2	0.2	100	0.5	2	40	2	2	140	100	CBE
FXT651	80	60	2	6	0.5	2	0.2	100	0.5	2	40	2	2	140	100	BCE
ZTX650	60	45	2	6	0.5	2	0.2	100	0.5	2	40	2	2	140	100	CBE
ZTX649	35	25	2	6	0.5	2	0.2	100	1	2	15	6	2	150	100	CBE
FXT649	35	25	2	6	0.5	2	0.2	100	1	2	15	6	2	150	100	BCE
PNP																
ZTX758	-400	-400	-0.5	-1	-0.5	-0.1	-0.01	50	-0.1	-5	40	-0.2	-10	50	-20	CBE
ZTX757	-300	-300	-0.5	-1	-0.5	-0.1	-0.01	40	-0.01	-5	50	-0.1	-5	30	-10	CBE
FXT757	-300	-300	-0.5	-1	-0.5	-0.1	-0.01	40	-0.01	-5	50	-0.1	-5	30	-10	BCE
ZTX776	-200	-200	-1	-2	-0.5	-0.5	-0.05	50	-0.5	-5	20	-1	-5	30	-10	CBE
ZTX756	-200	-200	-0.5	-1	-0.5	-0.1	-0.01	40	-0.01	-5	50	-0.1	-5	30	-10	CBE
ZTX755	-150	-150	-1	-2	-0.5	-1	-0.2	50	-0.5	-5	20	-1	-5	30	-10	CBE
FXT755	-150	-150	-1	-2	-0.5	-1	-0.2	50	-0.5	-5	20	-1	-5	30	-10	BCE
ZTX754	-125	-125	-1	-2	-0.5	-1	-0.2	50	-0.5	-5	20	-1	-5	30	-10	CBE
ZTX753	-120	-100	-2	-6	-0.5	-2	-0.2	100	-0.5	-2	25	-2	-2	100	-100	CBE
FXT753	-120	-100	-2	-6	-0.5	-2	-0.2	100	-0.5	-2	25	-2	-2	100	-100	BCE
ZTX752	-100	-80	-2	-6	-0.5	-2	-0.2	100	-0.5	-2	25	-2	-2	100	-100	CBE
ZTX751	-80	-60	-2	-6	-0.5	-2	-0.2	100	-0.5	-2	40	-2	-2	100	-100	CBE
FXT751	-80	-60	-2	-6	-0.5	-2	-0.2	100	-0.5	-2	40	-2	-2	100	-100	BCE
ZTX750	-60	-45	-2	-6	-0.5	-2	-0.2	100	-0.5	-2	40	-2	-2	100	-100	CBE
ZTX749	-35	-25	-2	-6	-0.5	-2	-0.2	100	-1	-2	15	-6	-2	100	-100	CBE
FXT749	-35	-25	-2	-6	-0.5	-2	-0.2	100	-1	-2	15	-6	-2	100	-100	BCE

E-Line Bipolar Transistors

High Performance Darlington Transistors (P_D= upto 1 Watt)

The devices shown in this table are designed for applications requiring very high current gain at current levels up to 1A and power dissipation up to 1 Watt. They are ideal for lamp, relay and solenoid drivers in wide ranging applications from dot matrix printers to the harsher automotive environments

PART NO.	V_{CBO}	V_{CEO}	I_C	I_{CM}	$V_{CE(sat)}$ max @			h_{FE} min @			h_{FE} min @			PIN OUT
	V	V	A	A	V	I_C mA	I_B mA		I_C mA	V_{CE} V		I_C A	V_{CE} V	123
NPN														
ZTX601	180	160	1	4	1.2	1000	10	2K-100K	500	10	1K	1	10	CBE
ZTX601A	180	160	1	4	1.2	1000	10	2K-20K	500	10	1K	1	10	CBE
ZTX601B	180	160	1	4	1.2	1000	10	10K-100K	500	10	5K	1	10	CBE
FXT601B	180	160	1	4	1.2	1000	10	10K-100K	500	10	5K	1	10	BCE
ZTX600	160	140	1	4	1.2	1000	10	2K-100K	500	10	1K	1	10	CBE
ZTX600A	160	140	1	4	1.2	1000	10	2K-20K	500	10	1K	1	10	CBE
ZTX600B	160	140	1	4	1.2	1000	10	10K-100K	500	10	5K	1	10	CBE
ZTX605	140	120	1	4	1.5	1000	1	5K	500	5	0.5K	2	5	CBE
FXT605	140	120	1	4	1.5	1000	1	5K	500	5	0.5K	2	5	BCE
ZTX604	120	100	1	4	1.5	1000	1	5K	500	5	0.5K	2	5	CBE
ZTX614	120	100	0.8	2	1.25	800	8	5K	100	5	10K	0.5	5	CBE
FXT614	120	100	0.8	2	1.25	800	8	5K	100	5	10K	0.5	5	BCE
BC372P	100	100	1	2	1.1	250	0.25	10K	100	5	8K	0.25	5	CBE
ZTX603	100	80	1	4	1	1000	1	5K	500	5	0.5K	2	5	CBE
FXT603	100	80	1	4	1	1000	1	5K	500	5	0.5K	2	5	BCE
ZTX602	80	60	1	4	1	1000	1	5K	500	5	0.5K	2	5	CBE
BCX38A	80	60	0.8	2	1.25	800	8	0.5K	100	5	1K	0.5	5	CBE
BCX38B	80	60	0.8	2	1.25	800	8	2K	100	5	4K	0.5	5	CBE
BCX38C	80	60	0.8	2	1.25	800	8	5K	100	5	10K	0.5	5	CBE
FXT38C	80	60	0.8	2	1.25	800	8	5K	100	5	10K	0.5	5	BCE
2N6725	60	50	1	2	1	200	2	15K	500	5	4K	1	5	CBE
2N6724	50	40	1	2	1	200	2	15K	500	5	4K	1	5	CBE
PNP														
ZTX705	-140	-120	-1	-4	-1.3	-1000	-1	3K	-100	-5	2K	-2	-5	CBE
FXT705	-140	-120	-1	-4	-1.3	-1000	-1	3K	-100	-5	2K	-2	-5	BCE
ZTX704	-120	-100	-1	-4	-1.3	-1000	-1	3K	-100	-5	2K	-2	-5	CBE
FXT704	-120	-100	-1	-4	-1.3	-1000	-1	3K	-100	-5	2K	-2	-5	BCE
ZTX712	-80	-60	-0.8	-2	-1.25	-800	-8	5K	-100	-5	10K	-0.5	-5	CBE
MPSA77P	-60	-60	-0.5	-2	-1.5	-100	-0.1	10K	-10	-5	10K	-0.1	-5	CBE

E-Line Bipolar Transistors

Medium Power Transistors (P_D=1 Watt)

This range of transistors rated up to 1 Watt have gains specified up to 1 Amp.

PART	V_{CBO}	V_{CEO}	I_C	I_{CM}	$V_{CE(sat)}$ max @			h_{FE} min @			h_{FE} min @			f_T min @		PIN
NO.	V	V	A	A	V	I_C mA	I_B mA		I_C mA	V_{CE} V		I_C A	V_{CE} V	MHz	I_C mA	OUT 123
NPN																
ZTX458	400	400	0.3	0.5	0.5	50	6	100	50	10	15	0.1	10	50	10	CBE
FXT458	400	400	0.3	0.5	0.5	50	6	100	50	10	15	0.1	10	50	10	BCE
ZTX457	300	300	0.5	1	0.3	100	10	50	50	10	25	0.1	10	75	50	CBE
ZTX455	160	140	1	2	0.7	150	15	100	150	10	–	–	–	100	50	CBE
FXT455	160	140	1	2	0.7	150	15	100	150	10	–	–	–	100	50	BCE
ZTX454	140	120	1	2	0.7	150	15	100	150	10	30	0.2	1	100	50	CBE
ZTX453	120	100	1	2	0.7	150	15	40	150	10	10	1	10	150	50	CBE
FXT453	120	100	1	2	0.7	150	15	40	150	10	10	1	10	150	50	BCE
ZTX452	100	80	1	2	0.7	150	15	40	150	10	10	1	10	150	50	CBE
ZTX451	80	60	1	2	0.35	150	15	50	150	10	10	1	10	150	50	CBE
FXT451	80	60	1	2	0.35	150	15	50	150	10	10	1	10	150	50	BCE
ZTX450	60	45	1	2	0.25	150	15	100	150	10	15	1	10	150	50	CBE
FXT450	60	45	1	2	0.25	150	15	100	150	10	15	1	10	150	50	BCE
ZTX449	50	30	1	2	0.5	1000	100	100	500	2	40	2	2	150	50	CBE
FXT449	50	30	1	2	0.5	1000	100	100	500	2	40	2	2	150	50	BCE
PNP																
ZTX558	-400	-400	-0.2	-0.5	-0.5	-50	-6	100	-50	-10	15	-0.1	-10	50	-10	CBE
ZTX557	-300	-300	-0.5	-1	-0.3	-50	-5	50	-10	-10	50	-0.05	-10	75	-50	CBE
FXT557	-300	-300	-0.5	-1	-0.3	-50	-5	50	-10	-10	50	-0.05	-10	75	-50	BCE
ZTX576	-200	-200	-1	-2	-0.3	-100	-10	50	-10	-10	50	-0.3	-10	100	-50	CBE
ZTX556	-200	-200	-0.5	-1	-0.3	-50	-5	50	-10	-10	50	-0.05	-10	75	-50	CBE
ZTX555	-160	-150	-1	-2	-0.3	-100	-10	50	-10	-10	50	-0.3	-10	100	-50	CBE
FXT555	-160	-150	-1	-2	-0.3	-100	-10	50	-10	-10	50	-0.3	-10	100	-50	BCE
ZTX554	-140	-125	-1	-2	-0.3	-100	-10	50	-10	-10	50	-0.3	-10	100	-50	CBE
ZTX553	-120	-100	-1	-2	-0.25	-150	-15	40	-150	-10	10	-1	-10	150	-50	CBE
FXT553	-120	-100	-1	-2	-0.25	-150	-15	40	-150	-10	10	-1	-10	150	-50	BCE
ZTX552	-100	-80	-1	-2	-0.25	-150	-15	40	-150	-10	10	-1	-10	150	-50	CBE
ZTX551	-80	-60	-1	-2	-0.35	-150	-15	50	-150	-10	10	-1	-10	150	-50	CBE
FXT551	-80	-60	-1	-2	-0.35	-150	-15	50	-150	-10	10	-1	-10	150	-50	BCE
ZTX550	-60	-45	-1	-2	-0.25	-150	-15	100	-150	-10	15	-1	-10	150	-50	CBE
FXT550	-60	-45	-1	-2	-0.25	-150	-15	100	-150	-10	15	-1	-10	150	-50	BCE
ZTX549A	-35	-30	-1	-2	-0.5	-1000	-100	150	-500	-2	40	-2	-2	100	-100	CBE
ZTX549	-35	-30	-1	-2	-0.5	-1000	-100	100	-500	-2	40	-2	-2	100	-100	CBE
FXT549	-35	-30	-1	-2	-0.5	-1000	-100	100	-500	-2	40	-2	-2	100	-100	BCE

E-Line Bipolar Transistors

Medium Power Transistors

General purpose transistors designed for amplification from d.c. to radio frequencies.

PART NO.	V_{CBO} V	V_{CEO} V	I_C A	$V_{CE(sat)}$ max @			h_{FE} min @			h_{FE} min @			f_T min @		PIN OUT 123
				V	I_C mA	I_B mA		I_C mA	V_{CE} V		I_C mA	V_{CE} V	MHz	I_C mA	
NPN															
2N6718	100	100	1	0.35	250	25	50	250	1	20	500	1	50	50	CBE
2N6731	100	80	1	0.35	350	35	100	10	2	100	350	2	50	200	CBE
2N6717	80	80	1	0.35	250	25	50	250	1	20	500	1	50	50	CBE
MPSA06	80	80	0.5	0.25	100	10	50	10	1	50	100	1	100	10	CBE
2N6716	60	60	1	0.35	250	25	50	250	1	20	500	1	50	50	CBE
ZTX337C	50	45	0.8	0.7	500	50	250	100	1	170	300	1	–	–	CBE
2N6715	50	40	1	0.5	1000	100	60	100	1	50	1000	1	50	50	CBE
2N6714	40	30	1	0.5	1000	100	60	100	1	50	1000	1	50	50	CBE
PNP															
2N6730	-100	-100	-1	-0.35	-250	-25	50	-250	-1	20	-500	-1	50	-50	CBE
2N6732	-100	-80	-1	-0.35	-350	-35	100	-10	-2	100	-350	-2	50	-200	CBE
2N6729	-80	-80	-1	-0.35	-250	-25	50	-250	-1	20	-500	-1	50	-50	CBE
MPSA56	-80	-80	-0.5	-0.25	-100	-10	50	-10	-1	50	-100	-1	100	-10	CBE
2N6728	-60	-60	-1	-0.35	-250	-25	50	-250	-1	20	-500	-1	50	-50	CBE
ZTX537C	-50	-45	-0.8	-0.7	-500	-50	250	-100	-1	170	-300	-1	–	–	CBE
2N6727	-50	-40	-1	-0.5	-1000	-100	60	-100	-1	50	-1000	-1	50	-50	CBE
2N6726	-40	-30	-1	-0.5	-1000	-100	60	-100	-1	50	-1000	-1	50	-50	CBE

General Purpose Transistors

PART NO.	V_{CBO} V	V_{CEO} V	I_C A	$V_{CE(sat)}$ max @			h_{FE} min @			f_T min @		PIN OUT 123
				V	I_C mA	I_B mA		I_C mA	V_{CE} V	MHz	I_C mA	
NPN												
2N6517	350	350	0.5	0.5	30	3	30	30	10	40	10	CBE
MPSA42	300	300	0.5	0.5	20	2.0	40	30	10	50	10	CBE
FXTA42	300	300	0.5	0.5	20	2.0	40	30	10	50	10	BCE
ZTX341	100	100	0.1	0.5	2	0.1	30	2	1	80	5	CBE
ZTX300	25	25	0.5	0.35	50	5.0	50	10	6	150	10	CBE
PNP												
2N6520	-350	-350	-0.5	-0.5	-30	-3.0	30	-30	-10	40	-10	CBE
MPSA92	-300	-300	-0.5	-0.5	-20	-2.0	25	-30	-10	50	-10	CBE
FXTA92	-300	-300	-0.5	-0.5	-20	-2.0	25	-30	-10	50	-10	BCE
ZTX541	-100	-100	-0.1	-0.5	-2	-0.1	30	-2	-1	80	-5	CBE
ZTX500	-25	-25	-0.2	-0.35	-50	-5.0	50	-10	-6	150	-10	CBE

E-Line Bipolar Transistors

PART NO.	V_{CBO}	V_{CEO}	I_C	$V_{CE(sat)}$ max @			h_{FE} min @			f_T min @		Switching times @			PIN OUT
	V	V	A	V	I_C mA	I_B mA		I_C mA	V_{CE} V	MHz	I_C mA	t_{on} ns	t_{off} ns	I_C mA	123
NPN															
MPS2222A	75	40	0.8	0.3	150	15	100	150	10	300	20	35	285	150	CBE
ZTX360	60	40	1	0.6	500	50	25	500	1	200	50	40	75	500	CBE
ZTX314	40	15	0.5	0.5	100	10	20	100	1	500	10	12	18	10	CBE
MPS2369A	40	15	0.5	0.2	10	1	20	100	1	-	-	12	18	10	CBE
PNP															
MPS2907A	-60	-60	-0.6	-0.4	-150	-15	100	-150	-10	200	-50	50	110	-150	CBE
ZTX510	-12	-12	-0.2	-0.5	-100	-10	40	-30	-0.5	400	-30	60	90	-30	CBE

Low Noise Transistors

These transistors are characterised for low noise, low level amplification and are ideally suited for audio pre-amplifiers and instrumentation, as well as universal applications.

PART NO.	V_{CBO}	V_{CEO}	I_C	$V_{CE(sat)}$ max @			h_{FE} min @			f_T min @		Noise figures max			PIN OUT
	V	V	A	V	I_C mA	I_B mA		I_C mA	V_{CE} V	MHz	I_C mA	@ dB	I_C µA	f Hz	123
NPN															
ZTX384C	45	30	0.2	0.25	10	0.5	250	2	5	150	10	4	200	30-15K	CBE
PNP															
ZTX214C	-45	-30	-0.2	-0.25	-10	-0.5	350	-2	-5	200	-10	2	-200	30-15K	CBE

E-Line Bipolar Transistors

RF Transistors

These transistors are designed for small signal amplification from RF to VHF/UHF frequencies. Applications areas include cordless telephones and keyless entry systems

PART NO.	V_{CBO} V	V_{CEO} V	f_T min @ MHz	I_C mA	Max noise figure N dB	I_C mA	f MHz	C_{obo} max pF	h_{FE} min	max	@ I_C mA	G_{pe} min dB	P_D mW	PIN OUT 123
NPN														
MPSH10P	30	25	650	4	5	2	500	0.65	60	–	4	–	500	CEB
ZTX325	30	15	1300	25	5	2	500	0.85‡	20	125	25	–	350	CBE
ZTX320	30	15	600	4	6	1	60	1.7	20	300	3	15‡	300	CBE
ZTX321	30	15	600	4	6	1	60	1.7	20	300	3	15‡	300	CBE
ZTX322	30	15	600	4	6	1	60	1.7	20	150	3	15‡	300	CBE
ZTX323	30	15	600	4	6	1	60	1.7	100	300	3	15‡	300	CBE
MPS5179	20	12	900	5	5	1.5	200	1	25	250	3	15	500	CBE

‡ Typical Values

Avalanche Transistors

Specifically designed to operate in the avalanche mode. Suitable for pulsing laser diodes, pulse generators and other applications requiring very fast edges.

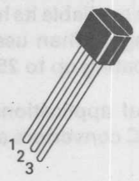
PART NO.	V_{CBO} V	V_{CEO} V	I_{CM} A	I_{SB} @ A	V_C V	C_{CE} nF	h_{FE} min @	I_C mA	f_T @ min MHz	I_C mA	P_D mW	PIN OUT 123
NPN												
ZTX415	260	100	60	25	250	0.62	25	10	40	0.01	680	CBE
ZTX413	150	50	50	31	130	4.7	50	10	150‡	10	500	CBE

‡ Typical Values

TO92 Bipolar Transistors

TO92 Devices

The following range of TO92 are available to cover the applications not requiring the extra power dissipation or smaller package size offered by E-Line



TO92

General Purpose Transistors

PART NO.	V_{CBO}	V_{CEO}	I_C	$V_{CE(sat)}$ max @			h_{FE} min @		f_T	P_D	PIN OUT
	V	V	mA	V	I_C mA	I_B mA		I_C mA	min MHz	mW	123
NPN											
MPSA44	400	400	300	0.75	50	5	40	100	-	625	EBC
BC639	80	80	1000	0.50	500	50	40	150	200*	800	ECB
MPS6601	25	25	1000	0.60	1000	100	30	1000	100	625	EBC
BC368	25	20	10000	0.50	1000	100	60	1000	65	800	ECB
PNP											
MPSA94	-400	-400	-300	-0.75	-50	-5	40	-100	20*	625	EBC
BC640	-80	-80	-1000	-0.50	-500	-50	40	-150	200*	800	ECB
MPS6651	-25	-25	-1000	-0.60	-1000	-100	30	-1000	100	625	EBC
BC369	-25	-20	-1000	-0.50	-1000	-100	60	-1000	65	800	ECB

*Typical values

Darlington Transistors

PART NO.	V_{CBO}	V_{CEO}	I_C	$V_{CE(sat)}$ max @			h_{FE} min @		f_T	P_D	PIN OUT
	V	V	mA	V	I_C mA	I_B mA		I_C mA	MHz	mW	123
NPN											
BC372	100	100	1000	1.0	250	0.25	10K	250	100	625	EBC
MPSA12P		20	500	1.0	10	0.01	20K	10	-	625	EBC
PNP											
MPSA77	-60	-60	-500	-1.5	-100	-0.10	10K	-250	-	625	EBC

RF Transistor

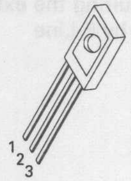
PART NO.	V_{CBO}	V_{CEO}	I_C	$V_{CE(sat)}$ max @			h_{FE} min @		f_T	P_D	PIN OUT
	V	V	mA	V	I_C mA	I_B mA		I_C mA	MHz	mW	123
NPN											
MPSH10	30	25	25	0.5	4	0.4	60	4	650	350	BEC

TO126 Bipolar Transistors

TO126 Devices

For applications requiring a higher power dissipation Zetex has made available its high current, low saturation devices in the TO126 package. When used with a heat sink the devices are capable of dissipating up to 25 Watts.

Typical applications areas are low drop out voltage regulators, DC-DC convertors and motor drivers.



TO126

PART NO.	V_{CBO}	V_{CEO}	I_C	I_{CM}	$V_{CE(sat)}$ max @			h_{FE} min @			h_{FE} min @			f_T typ @		PIN OUT
	V	V	A	A	V	I_C A	I_B mA		I_C A	V_{CE} V		I_C A	V_{CE} V	MHz	I_C mA	123
NPN																
ZBD857	330	300	3	4	0.31	3	600	100	0.5	10	15	2	10	80	100	BCE
ZBD853	200	100	4	10	0.25	4	400	100	2.0	2	20	10	2	130	100	BCE
ZBD849	80	30	5	20	0.28	5	200	100	1.0	1	30	20	2	100	100	BCE
PNP																
ZBD957	-330	-300	-1	-2	-0.29	-1	-300	100	-0.5	-10	90	-1	-10	85	-100	BCE
ZBD953	-140	-100	-4	-10	-0.47	-4	-400	100	-1.0	-1	30	-4	-1	125	-100	BCE
ZBD949	-50	-30	-5	-20	-0.45	-5	-300	100	-1.0	-1	75	-5	-1	100	-100	BCE

MOSFETs

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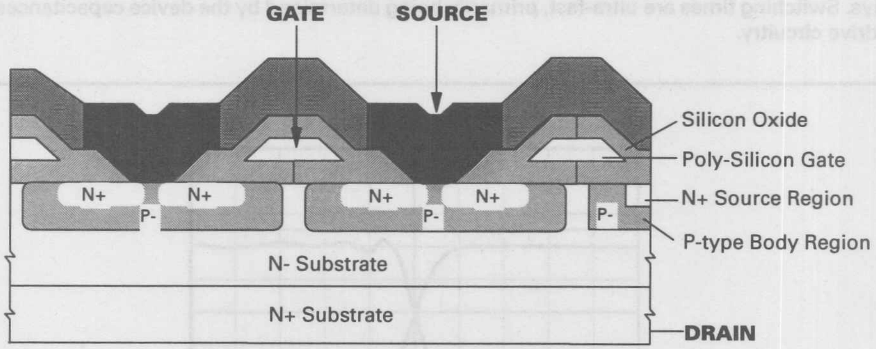
of switching and amplifying applications where high gain, hig fast switching speed are desired. They combine the current handling capabilities of bipolar transistors with the high input impedance and negative temperature coefficients of FETs.

Having considered the various MOSFET technologies available, Zetex has adopted two versions of the vertical DMOSFET structure. An interdigitated approach is used for high frequency devices, whilst when a lower on resistance is required a cell based design is used. Having these two approaches gives Zetex the flexibility to address a wider market.

Zetex DMOS Process

For the N channel device an N- epitaxial layer is grown on an N+ substrate. Next a series of P+ body regions are diffused into the epitaxial layer to give a good avalanche performance and to improve the safe operating area. A high quality passivated gate oxide is then grown and coated with polysilicon to form the gate. Self aligned against this gate are the P- body and N+ source regions, so that in the on state the length of the surface channel is the difference between the body and source sideways diffusions. This self alignment provides a structure which combines the low resistance associated with short channels with consistent device characteristics. Next the source and gate metallisations are deposited on the top surface, whilst the drain contact is made to the bottom surface. Finally an insulating layer is deposited on the top surface to help protect the devices.

Both N and P channel devices are available. However, as the mobility of the majority carriers within P type devices is lower a larger die is required to achieve the same on-resistance and current rating.



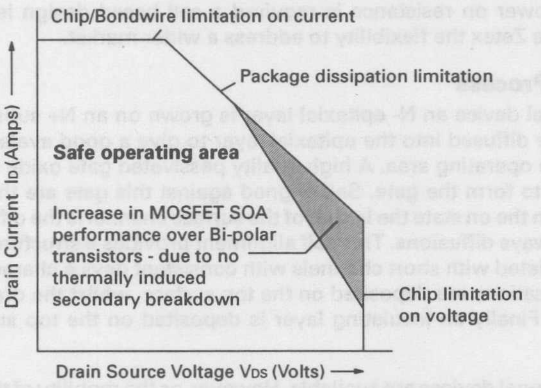
Cross Section of Zetex Vertical DMOS Process

MOSFET Characteristics

Thermal Runaway

The devices do not exhibit thermal runaway or thermally induced secondary breakdown.

Carrier mobility in a MOSFET channel region decreases with temperature. If localized heating occurs in a MOSFET the carrier mobility decreases in the region affected, and as a consequence, the localized current reduces. The negative feedback mechanism forces overload currents to be uniformly distributed within the transistor.


Chip/Bondwire limitation on current
Package dissipation limitation
Safe operating area
Increase in MOSFET SOA performance over Bi-polar transistors - due to no thermally induced secondary breakdown
Chip limitation on voltage
Drain Current ID (Amps)
Drain Source Voltage VDS (Volts)

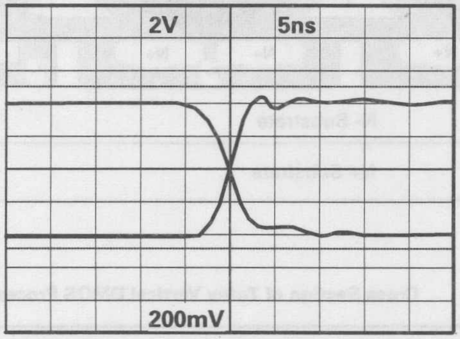
I_D vs V_{DS}

Temperature Stability

The transconductance and switching times of these MOSFETs change very little with temperature compared to bipolar transistors.

Fast Switching Speeds

MOSFETs are majority-carrier devices, and consequently do not exhibit minority carrier storage delays. Switching times are ultra-fast, primarily being determined by the device capacitances and the drive circuitry.



Typical MOSFET Switching Characteristic

MOSFET Characteristics

High Input Impedance

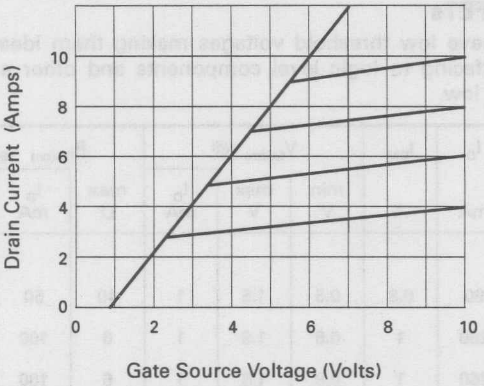
By virtue of the insulated gate structure, input currents are very low, typically a few pico amps at 25°C.Essentially this device is voltage controlled so it can be driven directly by logic.

High Gain

Current gains are generally in the range 10^5 to 10^6.

Linearity of Transfer Characteristics

Above the threshold voltage, the relationship between drain current and gate voltage in these short channel devices is approximately linear. In other words, the device transconductance, which is the rate of change of drain current with gate voltage, becomes constant at high drain currents.



Typical MOSFET Characteristics

Avalanche Capability

If these MOSFETs are biased so that for a short period their drain-source breakdown voltage is exceeded they can safely dissipate a rated current and energy. This often occurs when driving inductive loads, so in many cases these can be driven without the need for a catch diode.

Product Advantages for Circuit Design

1. Less peripheral components are required than in the case of bipolar types leading to reduced design time, less complexity and lower cost.

2. Can be easily connected in parallel to obtain very high current handling performance without the problem related to bipolar transistors, that of base current sharing resistors.

3. Improved reliability due to temperature stability and freedom from thermally induced secondary breakdown.

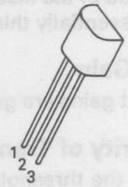
4. Avalanche ratings can remove the need for catch-diodes.

5. Higher frequency operation can improve the efficiency of the application.

MOSFETs

MOSFET Devices

This comprehensive range of MOSFET's is optimised for low on-resistance whilst maintaining a fast switching performance. Application areas vary from dialler circuits in electronic telephones, automotive solenoid drivers, DC-DC converters to general switching circuits.



E-Line
TO92 Compatible

Low Threshold MOSFETs

The following devices have low threshold voltages making them ideal for battery powered applications, direct interfacing to logic level components and other applications where the available drive voltage is low.

PART	BV_{DSS}	I_D	I_{DM}	$V_{GS(th)}$ @			$R_{DS(on)}$ @			Ciss	PIN
NO.	V	mA	A	min V	max V	I_D mA	max Ω	I_D mA	V_{GS} V	max pF	OUT 123
N-CHANNEL											
ZVNL535A	350	90	0.8	0.5	1.5	1	40	50	3	70	DGS
ZVN4424A	240	260	1	0.8	1.8	1	6	100	2.5	200	DGS
ZVN4424C	240	260	1	0.8	1.8	1	6	100	2.5	200	GDS
ZVNL120A	200	180	2	0.5	1.5	1	10	125	3	85	DGS
ZVNL120C	200	180	2	0.5	1.5	1	10	125	3	85	GDS
ZVNL110A	100	320	6	0.75	1.5	1	4.5	250	5	75	DGS
P-CHANNEL											
ZVP4424A	-240	-200	-1	-0.7	-2.0	-1	11	-100	-3.5	200	DGS
ZVP4424C	-240	-200	-1	-0.7	-2.0	-1	11	-100	-3.5	200	GDS
ZVP4105A	-50	-175	-0.52	-0.8	-2.0	-1	10	-100	-5	40	DGS

Avalanche Rated MOSFET

Developed particularly for driving relays in automotive applications where the avalanche capability removes the need for additional protection components.

PART	BV_{DSS}	I_D	I_{DM}	$V_{GS(th)}$ @			$R_{DS(on)}$ @			Ciss	PIN
NO.	V	mA	A	min V	max V	I_D mA	max Ω	I_D mA	V_{GS} V	max pF	OUT 123
ZVN4206AV	60	600	8	1.3	3	1	1.5	500	5	100	DGS

MOSFETs

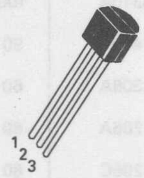
Small Signal N-Channel MOSFETs

PART NO.	BV_{DSS} V	I_D mA	I_{DM} A	$V_{GS(th)}$ @			$R_{DS(on)}$ @			Ciss max pF	PIN OUT 123
				min V	max V	I_D mA	max Ω	I_D mA	V_{GS} V		
N-CHANNEL											
ZVN0545A	450	90	0.6	1	3	1	50	100	10	70	DGS
ZVN0540A	400	90	0.6	1	3	1	50	100	10	70	DGS
ZVN2535A	350	90	1	1	3	1	35	100	10	70	DGS
ZVN0535A	350	90	0.6	1	3	1	50	100	10	70	DGS
ZVN0124A	240	160	2	1	3	1	16	250	10	85	DGS
ZVN2120A	200	180	2	1	3	1	10	250	10	85	DGS
ZVN2120C	200	180	2	1	3	1	10	250	10	85	GDS
BS107P	200	120	2	-	-	-	23	25	2.6	-	DGS
BS107PT	200	120	2	-	-	-	28	20	2.6	-	DGS
ZVN0120A	200	160	2	1	3	1	16	250	10	85	DGS
ZVN4310A	100	900	12	1	3	1	0.65	1500	5	350	DGS
ZVN4210A	100	450	6	0.8	2.4	1	1.8	500	5	100	DGS
ZVN2110A	100	320	6	0.8	2.4	1	4	1000	10	75	DGS
ZVN2110C	100	320	6	0.8	2.4	1	4	1000	10	75	GDS
ZVN3310A	100	200	2	0.8	2.4	1	10	500	10	40	DGS
ZVN1409A	90	10	0.04	0.8	2.4	0.1	250	5	10	6.5	DGS
ZVN4306A	60	1100	20	1.3	3	1	0.45	1500	5	350	DGS
ZVN4206A	60	600	8	1.3	3	1	1.5	500	5	100	DGS
ZVN4206C	60	600	8	1.3	3	1	1.5	500	5	100	GDS
ZVN2106A	60	450	8	0.8	2.4	1	2	1000	10	75	DGS
2N7000P	60	200	0.5	0.8	3	1	5	500	10	60	DGS
ZVN3306A	60	270	3	0.8	2.4	1	5	500	10	35	DGS
VN10LP	60	270	3	0.8	2.5	1	7.5	200	5	60	DGS
BS170P	60	270	3	0.8	3	1	5	200	10	60	DSG

MOSFETs

Small Signal P-Channel MOSFETs

PART NO.	BV_{DSS} V	I_D mA	I_{DM} A	$V_{GS(th)}$ min V	$V_{GS(th)}$ max V	@ I_D mA	$R_{DS(on)}$ max Ω	@ I_D mA	@ V_{GS} V	Ciss max pF	PIN OUT 123
P-CHANNEL											
ZVP0545A	-450	-45	-0.4	-1.5	-4.5	-1	150	-50	-10	120	DGS
ZVP0540A	-400	-45	-0.4	-1.5	-4.5	-1	150	-50	-10	120	DGS
ZVP0535A	-350	-50	-0.48	-1.5	-4.5	-1	100	-50	-10	120	DGS
ZVP2120A	-200	-120	-1.2	-1.5	-4.5	-1	25	-150	-10	100	DGS
ZVP2120C	-200	-120	-1.2	-1.5	-4.5	-1	25	-150	-10	100	GDS
ZVP0120A	-200	-110	-1	-1.5	-4.5	-1	32	-125	-10	100	DGS
ZVP1320A	-200	-70	-0.4	-1.5	-4.5	-1	80	-50	-10	50	DGS
ZVP2110A	-100	-230	-3	-1.5	-4.5	-1	8	-375	-10	100	DGS
ZVP2110C	-100	-230	-3	-1.5	-4.5	-1	8	-375	-10	100	GDS
ZVP3310A	-100	-140	-1.2	-1.5	-4.5	-1	20	-150	-10	50	DGS
ZVP2106A	-60	-280	-4	-1.5	-4.5	-1	5	-500	-10	100	DGS
ZVP2106C	-60	-280	-4	-1.5	-4.5	-1	5	-500	-10	100	GDS
ZVP3306A	-60	-160	-1.6	-1.5	-4.5	-1	14	-200	-10	50	DGS
BS250P	-45	-230	-3	-1.0	-3.5	-1	14	-200	-10	60	DGS



TO92

TO92 MOSFETs

PART NO.	BV_{DSS} V	I_D mA	I_{DM} A	$V_{GS(th)}$ min V	$V_{GS(th)}$ max V	@ I_D mA	$R_{DS(on)}$ max Ω	@ I_D mA	@ V_{GS} V	Ciss max pF	PIN OUT 123
N-CHANNEL											
VN2222LL	60	150	1.0	0.6	2.5	1	7.5	500	10	60	SGD
2N7000	60	200	0.5	0.8	3.0	1	5.0	500	10	60	SGD

IGBT Technology

Introduction

Zetex IGBTs are driven as easily as MOSFETs yet they have current ratings which can exceed similar sized bipolars and Darlingtons.With fast switching and high breakdown voltages they are rapidly replacing bipolar transistors in many higher voltage applications.

Processing

This is similar to the DMOSFET apart from the alternative substrate. Zetex IGBTs contain 'lifetime killers' which make them fast switching and a unique 'zig-zag' design which provides a high pulse current rating.

IGBT Advantages for Circuit Design

High current capability

Typically an IGBT has an equivalent on resistance of a tenth of a similar sized DMOSFET, and consequently a much higher continuous and pulse current capability.

Fast switching

The IGBT has virtually no storage time. Rise and fall times have been minimized to give a fast switching device.

MOS gate drive

The high input impedance of the MOS gate provides an essentially voltage controlled device. This can be directly driven by logic.

Low input capacitance

IGBTs have a much lower input capacitance than an equivalent MOSFET because the die area is a lot smaller.

N-Channel IGBT

PART NO.	BV_{DSS}	I_D	I_{DM}	$V_{GS(th)}$ @			$R_{DS(on)}$ @			t_{on}	t_{off}	PIN
				min	max	I_D	max	I_D	V_{GS}	max	max	OUT
	V	A	A	V	V	mA	Ω	A	V	ns	ns	123
N-CHANNEL												
ZCN0545A	450	0.32	2	1	3	1	6	>0.5	10	150	300	DGS

N-Channel IGBT with Integral Diode (Advanced Information).

PART NO.	BV_{DSS}	I_D	I_{DM}	$V_{GS(th)}$ @			$R_{DS(on)}$ @			PIN
				min	max	I_D	max	I_D	V_{GS}	OUT
	V	A	A	V	V	mA	Ω	A	V	123
N-CHANNEL										
ZCN9150A	500	0.32	4	1	3	1	6	>0.5	10	DGS

MOSFET Cross Reference List

Industry Type	Zetex Alternative
2N7000	2N7000
2N7007	ZVN0124A
2N7008	VN10LP
BS107	BS107P
BS107A	ZVN4424C
BS170	BS170P
BS208	ZVP4424A
BS250	BS250P
BS270	ZVN2106A
BSN205A	ZVN4424A
BSN205	ZVN4424C
BSN254	ZVN4424C
BSN254A	ZVN4424A
BSP204	ZVP4424C
BSP204A	ZVP4424A
BSP254	ZVP4424C
BSP254A	ZVP4424A
BSS100	ZVN2110A
BSS101	ZVN0124A
BSS110	ZVP4105A
BSS124	ZVN0540A
BSS88	ZVN4424C
BSS89	ZVN4424C
BSS92	ZVP4424C
BSS98	ZVNL110A
BST70A	ZVN2110A
BST72A	ZVN3310A
BST74A	ZVN2120A
BST76A	ZVN2120A
MPF6659	ZVN4206A
MPF6660	ZVN2106A
MPF6661	ZVN2110A
MPF89	ZVN2120A
MPF910	ZVN2106A
MPF930	ZVN4206A

Industry Type	Zetex Alternative
MPF960	ZVN4206A
MPF990	ZVN4210A
NDF7000A	ZVN2106A
PH6659	ZVN4206A
PH6660	ZVN2106A
PH6661	ZVN2110A
SN7000	2N7000
SP0610L	ZVP4105A
TN0106N3	ZVNL110A
TN0110N3	ZVNL110A
TN0520N3	ZVNL120A
TN0524N3	ZVN4424A
TN0535N3	ZVNL535A
TN0620N3	ZVN4424A
TN0624N3	ZVN4424A
TP0610L	ZVP4105A
TP0616N3	ZVP4424A
TP0620N3	ZVP4424A
VN0104N3	ZVN2106A
VN0106N3	ZVN2106A
VN0109N3	ZVN2110A
VN0116N3	ZVN2120A
VN0120N3	ZVN2120A
VN0300L	ZVN4206A
VN0535N3	ZVN2535A
VN0540N3	ZVN0540A
VN0545N3	ZVN0545A
VN0603L	ZVN2106A
VN0606L	ZVN2106A
VN0610LL	ZVN3306A
VN0808L	ZVN2110A
VN10KN3	VN10LP
VN10LM	VN10LP
VN1206L	ZVN2110A
VN1210L	ZVN2120A

Industry Type	Zetex Alternative
VN1304N3	ZVN3306A
VN1306N3	ZVN3306A
VN1310N3	ZVN3310A
VN1706L	ZVN4424A
VN1710L	ZVN2120A
VN2010L	ZVN2120A
VN2020L	ZVN2120A
VN2106N3	ZVN2106A
VN2110N3	ZVN2110A
VN2206N3	ZVN4306A
VN2210N3	ZVN4310A
VN2222LL	VN2222LL
VN2406L	ZVN4424A
VN2410L	ZVN4424A
VN45350L	ZVN0545A
VP0104N3	ZVP2106A
VP0106N3	ZVP2106A
VP0109N3	ZVP2110A
VP0116N3	ZVP2120A
VP0120N3	ZVP2120A
VP0300B	ZVP2106A
VP0300L	ZVP2106A
VP0545N3	ZVP0545A
VP0610L	ZVP2106A
VP0808L	ZVP2110A
VP1008L	ZVP2110A
VP1304N3	ZVP3306A
VP1306N3	ZVP3306A
VP1310N3	ZVP3310A
VP2020L	ZVP2120A
VP2104N3	ZVP2106A
VP2106N3	ZVP2106A
VP2110N3	ZVP2110A
VP2410L	ZVP4424A

Diodes

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– Schottky Diodes 2-34

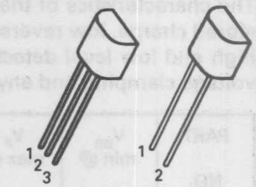
– High Speed Switching Dual Diodes 2-34

– Low Leakage Dual Diodes 2-34

Tuner Diodes

Two types of tuner diode are available from Zetex. The conventional abrupt tuner diode and the hyperabrupt tuner diode: the latter having a greater capacitance ratio for a given voltage change.

Typical application areas for these diodes are remote tuning control, automatic frequency control and octave tuning in mobile systems.



E-Line
TO92 Compatible

Hyperabrupt Variable Capacitance Tuner Diodes

PART NO.	V_R	I_F	Nominal Capacitance in pF @V_R=2V, f=1MHz			Minimum Q @ V_R=3V	Capacitance Ratio C_2/C_{20}, f=1MHz		PIN OUT	
	V	mA	min	nom	max	f=50MHz	min	max	1	2
ZC820	25	200	8	10	12	300	5	6.5	K	A
ZC821	25	200	12	15	18	300	5	6.5	K	A
ZC822	25	200	17.6	22	26.4	200	5	6.5	K	A
ZC823	25	200	26.4	33	39.6	200	5	6.5	K	A
ZC824	25	200	37.6	47	56.4	200	5	6.5	K	A
ZC825	25	200	54.4	68	81.6	100	5	6.5	K	A
ZC826	25	200	80	100	120	100	5	6.5	K	A

Available with 2V nominal capacitance ± 10% (suffix A) and ± 5% (suffix B)

Variable Capacitance Tuner Diode

PART NO.	V_R	Nominal Capacitance in pF @V_R=4V, f=1MHz			Minimum Q @ V_R=4V	Capacitance ratio C_2/C_{30}, f=1MHz	PIN OUT	
	V	min	nom	max	f=50MHz	min	1	2
ZC744	30	13.5	15	16.5	400	2.8	K	A

E-Line Diodes

Schottky Barrier Diodes

The characteristics of these devices are fast switching speed, low forward turnon voltage, low stored charge, low reverse leakage current and high rectification efficiency. Applications include high and low level detectors, mixing and modulation in the U.H.F. region, also pulse shaping, voltage clamping and any uses requiring picosecond switching times.

PART NO.	V_{BR} min @ I_R=10µA V	V_F max @ I_F=1mA mV	I_R max @ nA	V_R V	I_F min @ mA	V_F V	C_T @V_R=0V f=1MHz max pF	PIN OUT 1	2
ZC2800	70	410	200	50	15	1	2	K	A
ZC2811	15	410	100	10	20	1	1.2	K	A
ZC5800	50	410	200	35	15	1	2	K	A

High Speed Switching Dual Diodes

These dual diodes have been optimised for use in fast switching and phase detecting applications.

PART NO.	DESCRIPTION	V_{RRM} max V	$I_{F(av)}$ max mA	I_{FSM} max A	I_R@ V_{RRM} max µA	V_F max @ V	I_F mA	t_{rr} max ns	PIN OUT 1 2 3
ZDX6	Series diode pair	70	250	1.5	1	0.855	10	6	K1-A1K2-A2
ZDX2F	Common cathode	30	250	1.5	1	1.2	100	3	K1K2-A1-A2
ZDX2R	Common anode	30	250	1.5	1	1.2	100	4	A1A2-K1-K2
ZDX5	Series diode pair	30	250	1.5	1	0.855	10	6	K1-A1K2-A2
ZDX1F	Common cathode	15	250	1.5	1	1.2	100	3	K1K2-A1-A2
ZDX1R	Common anode	15	250	1.5	1	1.2	100	4	A1A2-K1-K2

Low Leakage Dual Diodes

Designed specifically for applications requiring low leakage.

PART NO.	DESCRIPTION	V_{RRM} max V	$I_{F(av)}$ max mA	I_{FSM} max A	V_F @ I_F=200mA max V	t_{rr} max ns	t_{fr} max ns	I_R @ V_{RRM} max nA	PIN OUT 1 2 3
ZDX4F	Common cathode	100	250	3	1.4	400	10	5	K1K2-A1-A2
ZDX4R	Common anode	100	250	3	1.4	400	10	5	A1A2-K1-K2
ZDX3F	Common cathode	50	250	3	1.4	400	10	5	K1K2-A1-A2
ZDX3R	Common anode	50	250	3	1.4	400	10	5	A1A2-K1-K2

Datasheets

This section contains data on devices from the selection tables. Some changes to earlier published data have been made. The data presented here supersedes all previous specifications.

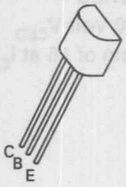
NPN SILICON PLANAR
MEDIUM POWER TRANSISTOR

2N6517

ISSUE 1 – MARCH 94

FEATURES

- 350 Volt V_{CEO}
- Gain of 15 at I_C=100mA



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	350	V
Collector-Emitter Voltage	V_{CEO}	350	V
Emitter-Base Voltage	V_{EBO}	6	V
Base Current	I_B	250	mA
Continuous Collector Current	I_C	500	mA
Power Dissipation at T_{amb}= 25°C	P_{tot}	680	mW
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +200	°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

PARAMETER	SYMBOL	MIN.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	350		V	I_C=100μA, I_E=0
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	350		V	I_C=1mA, I_B=0*
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	5		V	I_E=10μA, I_C=0
Collector Cut-Off Current	I_{CBO}		50	nA	V_{CB}=250V, I_E=0
Emitter Cut-Off Current	I_{EBO}		50	nA	V_{EB}=5V, I_C=0
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$		0.3 0.35 0.5 1.0	V V V V	I_C=10mA, I_B=1mA* I_C=20mA, I_B=2mA* I_C=30mA, I_B=3mA* I_C=50mA, I_B=5mA*
Base-Emitter Saturation Voltage	$V_{BE(sat)}$		0.80 0.85 0.90	V V V	I_C=10mA, I_B=1mA* I_C=20mA, I_B=2mA* I_C=30mA, I_B=3mA*
Base-Emitter Turn-On Voltage	$V_{BE(on)}$		2.0	V	I_C=100mA, V_{CE}=10V*
Static Forward Current Transfer Ratio	h_{FE}	20 30 30 20 15	 200 200 		I_C=1mA, V_{CE}=10V I_C=10mA, V_{CE}=10V* I_C=30mA, V_{CE}=10V* I_C=50mA, V_{CE}=10V* I_C=100mA, V_{CE}=10V*
Transition Frequency	f_T	40		MHz	I_C=10mA, V_{CE}=20V, f=20MHz

*Measured under pulsed conditions. Pulse width=300μs. Duty cycle ≤2%

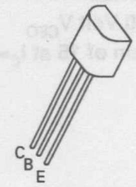
PNP SILICON PLANAR MEDIUM POWER TRANSISTOR

2N6520

ISSUE 1 – MARCH 94

FEATURES

- 350 Volt V_{CEO}
- Gain of 15 at I_C=-100mA



E-Line

TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	-350	V
Collector-Emitter Voltage	V_{CEO}	-350	V
Emitter-Base Voltage	V_{EBO}	-5	V
Base Current	I_B	-250	mA
Continuous Collector Current	I_C	-500	mA
Power Dissipation at T_{amb}= 25°C	P_{tot}	680	mW
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +200	°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

PARAMETER	SYMBOL	MIN.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	-350		V	I_C=-100µA, I_E=0
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	-350		V	I_C=-1mA, I_B=0*
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	-5		V	I_E=-10µA, I_C=0
Collector Cut-Off Current	I_{CBO}		-50	nA	V_{CB}=-250V, I_E=0
Emitter Cut-Off Current	I_{EBO}		-50	nA	V_{EB}=-4V, I_C=0
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$		-0.3 -0.35 -0.5 -1.0	V V V V	I_C=-10mA, I_B=-1mA* I_C=-20mA, I_B=-2mA* I_C=-30mA, I_B=-3mA* I_C=-50mA, I_B=-5mA*
Base-Emitter Saturation Voltage	$V_{BE(sat)}$		-0.80 -0.85 -0.90	V V V	I_C=-10mA, I_B=-1mA* I_C=-20mA, I_B=-2mA* I_C=-30mA, I_B=-3mA*
Base-Emitter Turn-On Voltage	$V_{BE(on)}$		-2.0	V	I_C=-100mA, V_{CE}=-10V*
Static Forward Current Transfer Ratio	h_{FE}	20 30 30 20 15	 200 200 		I_C=-1mA, V_{CE}=-10V I_C=-10mA, V_{CE}=-10V* I_C=-30mA, V_{CE}=-10V* I_C=-50mA, V_{CE}=-10V* I_C=-100mA, V_{CE}=-10V*
Transition Frequency	f_T	40		MHz	I_C=-10mA, V_{CE}=-20V, f=20MHz

*Measured under pulsed conditions. Pulse width=300µs. Duty cycle ≤2%

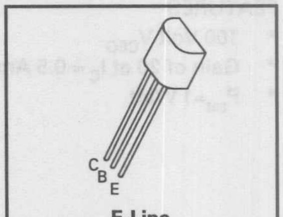
NPN SILICON PLANAR MEDIUM POWER TRANSISTORS

2N6714
2N6715

ISSUE 1 – MARCH 94

FEATURES

- 40 Volt V_{CEO}
- Gain of 50 at I_C= 1 Amp
- P_{tot}= 1 Watt



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	2N6714	2N6715	UNIT
Collector-Base Voltage	V_{CBO}	40	50	V
Collector-Emitter Voltage	V_{CEO}	30	40	V
Emitter-Base Voltage	V_{EBO}	5		V
Peak Pulse Current	I_{CM}	2		A
Continuous Collector Current	I_C	1		A
Power Dissipation at T_{amb}= 25°C	P_{tot}	1		W
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +200		°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

PARAMETER	SYMBOL	2N6714		2N6715		UNIT	CONDITIONS.
		MIN.	MAX.	MIN.	MAX.		
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	40		50		V	I_C=1mA, I_E=0
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	30		40		V	I_C=10mA, I_B=0*
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	5		5		V	I_E=1mA, I_C=0
Collector Cut-Off Current	I_{CBO}		0.1		 0.1	µA µA	V_{CB}=40V, I_E=0 V_{CB}=50V, I_E=0
Emitter Cut-Off Current	I_{EBO}		0.1		0.1	µA	V_{EB}=5V, I_C=0
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$		0.5		0.5	V	I_C=1A, I_B=100mA*
Base-Emitter Turn-On Voltage	$V_{BE(on)}$		1.2		1.2	V	I_C=1A, V_{CE}=1V*
Static Forward Current Transfer Ratio	h_{FE}	55 60 50	 250	55 60 50	 250		I_C=10mA, V_{CE}=1V* I_C=100mA, V_{CE}=1V* I_C=1A, V_{CE}=1V*
Transition Frequency	f_T	50	500	50	500	MHz	I_C=50mA, V_{CE}=10V
Collector Base Capacitance	C_{CB}		30		30	pF	V_{CE}=10V, f=1MHz

*Measured under pulsed conditions. Pulse width=300µs. Duty cycle ≤2%

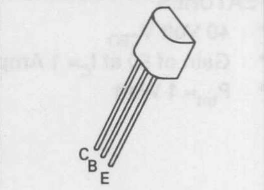
NPN SILICON PLANAR MEDIUM POWER TRANSISTORS

2N6716
2N6717
2N6718

ISSUE 1 – MARCH 94

FEATURES

- * 100 Volt V_{CEO}
- * Gain of 20 at I_C = 0.5 Amp
- * P_{tot}=1 Watt



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	2N6716	2N6717	2N6718	UNIT
Collector-Base Voltage	V_{CBO}	60	80	100	V
Collector-Emitter Voltage	V_{CEO}	60	80	100	V
Emitter-Base Voltage	V_{EBO}	5			V
Peak Pulse Current	I_{CM}	2			A
Continuous Collector Current	I_C	1			A
Power Dissipation at T_{amb}= 25°C	P_{tot}	1			W
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +200			°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

PARAMETER	SYMBOL	2N6716		2N6717		2N6718		UNIT	CONDITIONS.
		MIN.	MAX	MIN.	MAX	MIN.	MAX		
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	60		80		100		V	I_C=0.1mA, I_E=0
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	60		80		100		V	I_C=1mA, I_B=0*
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	5		5		5		V	I_E=1mA, I_C=0
Collector Cut-Off Current	I_{CBO}		1					µA	V_{CB}=60V, I_E=0
					1			µA	V_{CB}=80V, I_E=0
							1	µA	V_{CB}=100V, I_E=0
Emitter Cut-Off Current	I_{EBO}		1		1		1	µA	V_{EB}=5V, I_C=0
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$		0.5		0.5		0.5	V	I_C=250mA, I_B=10mA*
			0.35		0.35		0.35		I_C=250mA,I_B=25mA*
Base-Emitter Turn-On Voltage	$V_{BE(on)}$		1.2		1.2		1.2	V	I_C=250mA, V_{CE}=1V*
Static Forward Current Transfer Ratio	h_{FE}	80		80		80			I_C=50mA, V_{CE}=1V*
		50	250	50	250	50	250		I_C=250mA, V_{CE}=1V*
		20		20		20			I_C=500mA, V_{CE}=1V*
Transition Frequency	f_T	50	500	50	500	50	500	MHz	I_C=50mA, V_{CE}=10V
Collector Base Capacitance	C_{CB}		30		30		30	pF	V_{CE}=10V, f=1MHz

*Measured under pulsed conditions. Pulse width=300µs. Duty cycle ≤2%

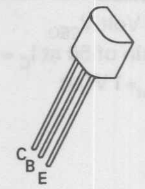
NPN SILICON PLANAR MEDIUM POWER DARLINGTON TRANSISTORS

2N6724
2N6725

ISSUE 1 – MARCH 94

FEATURES

- 50 Volt V_{CEO}
- Gain of 15k at $I_C = 0.5$ Amp
- P_{tot}=1 Watt



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	2N6724	2N6725	UNIT
Collector-Base Voltage	V_{CBO}	50	60	V
Collector-Emitter Voltage	V_{CEO}	40	50	V
Emitter-Base Voltage	V_{EBO}	10		V
Peak Pulse Current	I_{CM}	2		A
Continuous Collector Current	I_C	1		A
Power Dissipation at T_{amb}= 25°C	P_{tot}	1		W
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +200		°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

PARAMETER	SYMBOL	2N6724		2N6725		UNIT	CONDITIONS.
		MIN.	MAX.	MIN.	MAX.		
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	50		60		V	I_C=1μA, I_E=0
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	40		50		V	I_C=1mA, I_B=0*
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	10		10		V	I_E=10μA, I_C=0
Collector Cut-Off Current	I_{CBO}		1.0		 1.0	μA μA	V_{CB}=30V, I_E=0 V_{CB}=40V, I_E=0
Emitter Cut-Off Current	I_{EBO}		0.1		0.1	μA	V_{EB}=8V, I_C=0
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$		1.0 1.5		1.0 1.5	V V	I_C=200mA, I_B=2mA* I_C=1A, I_B=2mA*
Base-Emitter Saturation Voltage	$V_{BE(sat)}$		2.0		2.0	V	I_C=1A, I_B=2mA*
Base-Emitter Turn-On Voltage	$V_{BE(on)}$		2.0		2.0	V	I_C=1A, V_{CE}=5V*
Static Forward Current Transfer Ratio	h_{FE}	25K 15K 4K	 40K	25K 15K 4K	 40K		I_C=200mA, V_{CE}=5V* I_C=500mA, V_{CE}=5V* I_C=1A, V_{CE}=5V*
Collector Base Capacitance	C_{CB}		10		10	pF	V_{CB}=10V, f=1MHz

*Measured under pulsed conditions. Pulse width=300μs. Duty cycle ≤2%

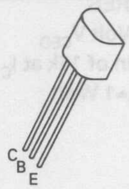
PNP SILICON PLANAR MEDIUM POWER TRANSISTORS

2N6726
2N6727

ISSUE 1 – MARCH 94

FEATURES

- 40 Volt V_{CEO}
- Gain of 50 at I_C = 1 Amp
- P_{tot}=1 Watt



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	2N6726	2N6727	UNIT
Collector-Base Voltage	V_{CBO}	-40	-50	V
Collector-Emitter Voltage	V_{CEO}	-30	-40	V
Emitter-Base Voltage	V_{EBO}	-5		V
Peak Pulse Current	I_{CM}	-2		A
Continuous Collector Current	I_C	-1		A
Power Dissipation at T_{amb}= 25°C	P_{tot}	1		W
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +200		°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

PARAMETER	SYMBOL	2N6726		2N6727		UNIT	CONDITIONS.
		MIN.	MAX.	MIN.	MAX.		
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	-40		-50		V	I_C=-1mA, I_E=0
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	-30		-40		V	I_C=-10mA, I_B=0*
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	-5		-5		V	I_E=-1mA, I_C=0
Collector Cut-Off Current	I_{CBO}		-0.1		 -0.1	μA μA	V_{CB}=-40V, I_E=0 V_{CB}=-50V, I_E=0
Emitter Cut-Off Current	I_{EBO}		-0.1		-0.1	μA	V_{EB}=-5V, I_C=0
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$		-0.5		-0.5	V	I_C=-1A, I_B=-100mA*
Base-Emitter Turn-On Voltage	$V_{BE(on)}$		-1.2		-1.2	V	I_C=-1A, V_{CE}=-1V*
Static Forward Current Transfer Ratio	h_{FE}	55 60 50	 250	55 60 50	 250		I_C=-10mA, V_{CE}=-1V* I_C=-100mA, V_{CE}=-1V* I_C=-1A, V_{CE}=-1V*
Transition Frequency	f_T	50	500	50	500	MHz	I_C=-50mA, V_{CE}=-10V
Collector Base Capacitance	C_{CB}		30		30	pF	V_{CE}=-10V, f=1MHz

*Measured under pulsed conditions. Pulse width=300μs. Duty cycle ≤2%

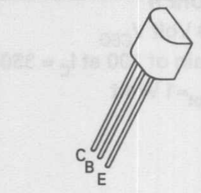
PNP SILICON PLANAR MEDIUM POWER TRANSISTORS

2N6728
2N6729
2N6730

ISSUE 1 – MARCH 94

FEATURES

- * 100 Volt V_{CEO}
- * Gain of 20 at I_C = 0.5 Amp
- * P_{tot}=1 Watt



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	2N6728	2N6729	2N6730	UNIT
Collector-Base Voltage	V_{CBO}	-60	-80	-100	V
Collector-Emitter Voltage	V_{CEO}	-60	-80	-100	V
Emitter-Base Voltage	V_{EBO}	-5			V
Peak Pulse Current	I_{CM}	-2			A
Continuous Collector Current	I_C	-1			A
Power Dissipation at T_{amb}= 25°C	P_{tot}	1			W
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +200			°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

PARAMETER	SYMBOL	2N6728		2N6729		2N6730		UNIT	CONDITIONS.
		MIN.	MAX	MIN.	MAX	MIN.	MAX		
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	-60		-80		-100		V	I_C=-0.1mA, I_E=0
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	-60		-80		-100		V	I_C=-1mA, I_B=0*
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	-5		-5		-5		V	I_E=-1mA, I_C=0
Collector Cut-Off Current	I_{CBO}		-1		 -1		 -1	µA µA µA	V_{CB}=-60V, I_E=0 V_{CB}=-80V, I_E=0 V_{CB}=-100V, I_E=0
Emitter Cut-Off Current	I_{EBO}		-1		-1		-1	µA	V_{EB}=-5V, I_C=0
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$		-0.5 -0.35		-0.5 -0.35		-0.5 -0.35	V	I_C=-250mA,I_B=-10mA* I_C=-250mA,I_B=-25mA*
Base-Emitter Turn-On Voltage	$V_{BE(on)}$		-1.2		-1.2		-1.2	V	I_C=-250mA, V_{CE}=-1V*
Static Forward Current Transfer Ratio	h_{FE}	80 50 20	 250	80 50 20	 250	80 50 20	 250		I_C=-50mA, V_{CE}=-1V* I_C=-250mA, V_{CE}=-1V* I_C=-500mA, V_{CE}=-1V*
Transition Frequency	f_T	50	500	50	500	50	500	MHz	I_C=-50mA, V_{CE}=-10V
Collector Base Capacitance	C_{CB}		30		30		30	pF	V_{CE}=-10V, f=1MHz

*Measured under pulsed conditions. Pulse width=300µs. Duty cycle ≤2%

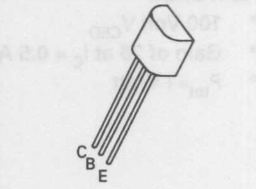
NPN SILICON PLANAR MEDIUM POWER TRANSISTOR

2N6731

ISSUE 1 – MARCH 94

FEATURES

- 80 Volt V_{CEO}
- Gain of 100 at I_C = 350 mA
- P_{tot}=1 Watt



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	100	V
Collector-Emitter Voltage	V_{CEO}	80	V
Emitter-Base Voltage	V_{EBO}	5	V
Peak Pulse Current	I_{CM}	2	A
Continuous Collector Current	I_C	1	A
Power Dissipation at T_{amb}= 25°C	P_{tot}	1	W
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +200	°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	100			V	I_C=100μA, I_E=0
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	80			V	I_C=10mA, I_B=0*
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	5			V	I_E=1mA, I_C=0
Collector Cut-Off Current	I_{CBO}			0.1	μA	V_{CB}=80V, I_E=0
Emitter Cut-Off Current	I_{EBO}			10	μA	V_{EB}=5V, I_C=0
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$			0.35	V	I_C=350mA, I_B=35mA*
Base-Emitter Turn-On Voltage	$V_{BE(on)}$			1.0	V	I_C=350mA, V_{CE}=2V*
Static Forward Current Transfer Ratio	h_{FE}	100 100		 300		I_C=10mA, V_{CE}=2V* I_C=350mA, V_{CE}=2V*
Transition Frequency	f_T	50		500	MHz	I_C=200mA, V_{CE}=5V f=20MHz
Collector-Base Capacitance	C_{CB}			20	pF	V_{CB}=10V, f=1MHz

*Measured under pulsed conditions. Pulse width=300μs. Duty cycle ≤2%

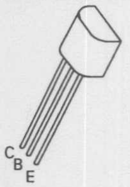
PNP SILICON PLANAR MEDIUM POWER TRANSISTOR

2N6732

ISSUE 1 – MARCH 94

FEATURES

- * 80 Volt V_{CEO}
- * Gain of 100 at I_C = 350 mA
- * P_{tot}=1 Watt



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	-100	V
Collector-Emitter Voltage	V_{CEO}	-80	V
Emitter-Base Voltage	V_{EBO}	-5	V
Peak Pulse Current	I_{CM}	-2	A
Continuous Collector Current	I_C	-1	A
Power Dissipation at T_{amb}= 25°C	P_{tot}	1	W
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +200	°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

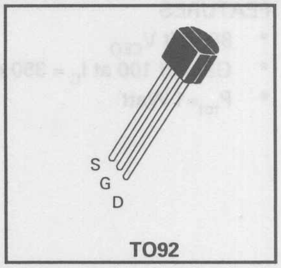
PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	-100			V	I_C=-100μA, I_E=0
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	-80			V	I_C=-10mA, I_B=0*
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	-5			V	I_E=-1mA, I_C=0
Collector Cut-Off Current	I_{CBO}			-0.1	μA	V_{CB}=-80V, I_E=0
Emitter Cut-Off Current	I_{EBO}			-10	μA	V_{EB}=-5V, I_C=0
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$			-0.35	V	I_C=-350mA, I_B=-35mA*
Base-Emitter Turn-On Voltage	$V_{BE(on)}$			-1.0	V	I_C=-350mA, V_{CE}=-2V*
Static Forward Current Transfer Ratio	h_{FE}	100 100		 300		I_C=-10mA, V_{CE}=-2V* I_C=-350mA, V_{CE}=-2V*
Transition Frequency	f_T	50		500	MHz	I_C=-200mA, V_{CE}=-5V f=20MHz
Collector-Base Capacitance	C_{CB}			20	pF	V_{CB}=-10V, f=1MHz

*Measured under pulsed conditions. Pulse width=300μs. Duty cycle ≤2%

N-CHANNEL ENHANCEMENT MODE VERTICAL DMOS FET

ISSUE 2– NOVEMBER 94

2N7000



ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Emitter Voltage	V_{CES}	60	V
Continuous Drain Current	I_D	0.2	A
Pulsed Drain Current	I_{DM}	0.5	A
Gate Source Vootage	V_{GS}	±40	V
Power Dissipation at T_{amb}=25°C	P_{tot}	400	mW
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +150	°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated)

PARAMETER	SYMBOL	MIN.	MAX.	UNIT	CONDITIONS.
Drain-Source Breakdown Voltage	BV_{DSS}	60		V	I_D=10μA, V_{GS}=0V
Gate-Source Threshold Voltage	$V_{GS(th)}$	0.8	3.0	V	I_D=1mA, V_{DS}= V_{GS}
Gate-Body Leakage	I_{GSS}		10	nA	V_{GS}=± 15V, V_{DS}=0V
Zero Gate Voltage Drain Current	I_{DSS}		1 1	μA mA	V_{DS}=48V, V_{GS}=0 V_{DS}=48V, V_{GS}=0V, T=125°C(2)
On-State Drain Current(1)	$I_{D(on)}$	75		mA	V_{DS}=10V, V_{GS}=4.5V
Static Drain-Source On-State Voltage (1)	$V_{DS(on)}$		2.5 0.4	V V	V_{GS}=10V,I_D=500mA V_{GS}=4.5V,I_D=75mA
Static Drain-Source On-State Resistance (1)	$R_{DS(on)}$		5	Ω	V_{GS}=10V,I_D=500mA
Forward Transconductance(1)(2)	g_{fs}	100		mS	V_{DS}=10V,I_D=200mA
Input Capacitance (2)	C_{iss}		60	pF	V_{DS}=25V, V_{GS}=0V, f=1MHz
Common Source Output Capacitance (2)	C_{oss}		25	pF	
Reverse Transfer Capacitance (2)	C_{rss}		5	pF	
Turn-On Time (2)(3)	$t_{(on)}$		10	ns	V_{DD}≈15V, I_D=500mA R_g=25Ω, R_L=25Ω
Turn-Off Time (2)(3)	$t_{(off)}$		10	ns	

(1) Measured under pulsed conditions. Width=300μs. Duty cycle ≤2% (2) Sample test.
(3) Switching times measured with 50Ω source impedance and <5ns rise time on a pulse generator

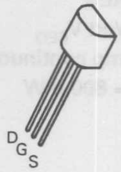
N-CHANNEL ENHANCEMENT MODE VERTICAL DMOS FET

ISSUE 2 – MARCH 94

2N7000P

FEATURES

- * 60 Volt V_{CEO}
- * $R_{DS(on)} = 5\ \Omega$



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Drain-Source Voltage	V_{DS}	60	V
Continuous Drain Current at T_{amb}=25°C	I_D	200	mA
Pulsed Drain Current	I_{DM}	500	mA
Gate-Source Voltage	V_{GS}	± 40	V
Power Dissipation at T_{amb}=25°C	P_{tot}	400	mW
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +150	°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

PARAMETER	SYMBOL	MIN.	MAX.	UNIT	CONDITIONS.
Drain-Source Breakdown Voltage	BV_{DSS}	60		V	I_D=10µA, V_{GS}=0V
Gate-Source Threshold Voltage	$V_{GS(th)}$	0.8	3	V	I_D=1mA, V_{DS}= V_{GS}
Gate-Body Leakage	I_{GSS}		10	nA	V_{GS}=± 15V, V_{DS}=0V
Zero Gate Voltage Drain Current	I_{DSS}		1 1	µA mA	V_{DS}=48V, V_{GS}=0 V_{DS}=48V, V_{GS}=0V, T=125°C(2)
On-State Drain Current(1)	$I_{D(on)}$	75		mA	V_{DS}=10V, V_{GS}=4.5V
Static Drain-Source On-State Voltage (1)	$V_{DS(on)}$		2.5 0.4	V V	V_{GS}=10V,I_D=500mA V_{GS}=4.5V,I_D=75mA
Static Drain-Source On-State Resistance (1)	$R_{DS(on)}$		5	Ω	V_{GS}=10V,I_D=500mA
Forward Transconductance(1)(2)	g_{fs}	100		mS	V_{DS}=10V,I_D=200mA
Input Capacitance (2)	C_{iss}		60	pF	V_{DS}=25V, V_{GS}=0V, f=1MHz
Common Source Output Capacitance (2)	C_{oss}		25	pF	
Reverse Transfer Capacitance (2)	C_{rss}		5	pF	
Turn-On Time (2)(3)	$t_{(on)}$		10	ns	V_{DD}≈15V, I_D=500mA R_g=25Ω, R_L=25Ω
Turn-Off Time (2)(3)	$t_{(off)}$		10	ns	

(1) Measured under pulsed conditions. Width=300µs. Duty cycle ≤2% (2) Sample test.
(3) Switching times measured with 50Ω source impedance and <5ns rise time on a pulse generator

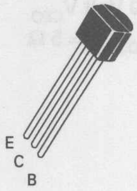
NPN SILICON PLANAR MEDIUM POWER TRANSISTOR

BC368

ISSUE 1 – SEPT 93

FEATURES

- 20 Volt V_{CEO}
- 1 Amp continuous current
- P_{tot}= 800 mW



TO92

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	25	V
Collector-Emitter Voltage	V_{CEO}	20	V
Emitter-Base Voltage	V_{EBO}	5	V
Continuous Collector Current	I_C	1	A
Power Dissipation at T_{amb}=25°C	P_{tot}	800	mW
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +150	°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	25			V	I_C=100μA, I_E=0
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	20			V	I_C=10mA, I_B=0*
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	5			V	I_E=100μA, I_C=0
Collector Cut-Off Current	I_{CBO}			10	μA	V_{CB}=25V
Emitter Cut-Off Current	I_{EBO}			10	μA	V_{EB}=5V, I_C=0
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$			0.5	V	I_C=1A, I_B=100mA*
Base-Emitter Turn-on Voltage	$V_{BE(on)}$			1	V	I_C=1A,V_{CE}=1V*
Static Forward Current Transfer Ratio	h_{FE}	50 85 60		 375 		I_C=5mA, V_{CE}=10V* I_C=500mA, V_{CE}=1V* I_C=1A, V_{CE}=1V*
Transition Frequency	f_T	65			MHz	I_C=10mA, V_{CE}=5V f=100MHz

*Measured under pulsed conditions. Pulse width=300μs. Duty cycle ≤ 2%

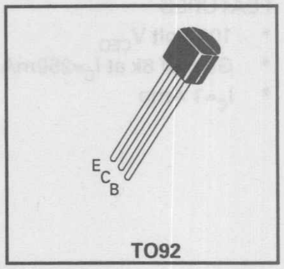
PNP SILICON PLANAR MEDIUM POWER TRANSISTOR

BC369

ISSUE 1 – SEPT 93

FEATURES

- 20 Volt V_{CEO}
- 1 Amp continuous current
- P_{tot}= 800 mW



TO92

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	-25	V
Collector-Emitter Voltage	V_{CEO}	-20	V
Emitter-Base Voltage	V_{EBO}	-5	V
Continuous Collector Current	I_C	-1	A
Power Dissipation at T_{amb}=25°C	P_{tot}	800	mW
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +150	°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	-25			V	I_C=-100μA, I_E=0
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	-20			V	I_C=-10mA, I_B=0*
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	-5			V	I_E=-100μA, I_C=0
Collector Cut-Off Current	I_{CBO}			-10	μA	V_{CB}=-25V
Emitter Cut-Off Current	I_{EBO}			-10	μA	V_{EB}=-5V, I_C=0
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$			-0.5	V	I_C=-1A, I_B=-100mA*
Base-Emitter Turn-on Voltage	$V_{BE(on)}$			-1.0	V	I_C=-1A,V_{CE}=-1V*
Static Forward Current Transfer Ratio	h_{FE}	50 85 60		 375 		I_C=-5mA, V_{CE}=-10V* I_C=-500mA, V_{CE}=-1V* I_C=-1A, V_{CE}=-1V*
Transition Frequency	f_T	65			MHz	I_C=-10mA, V_{CE}=-5V f=100MHz

*Measured under pulsed conditions. Pulse width=300μs. Duty cycle ≤ 2%

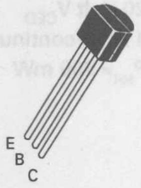
NPN SILICON PLANAR MEDIUM POWER DARLINGTON TRANSISTOR

BC372

ISSUE 2 – SEPT 93

FEATURES

- 100 Volt V_{CEO}
- Gain of 8k at I_C=250mA
- I_C=1 Amp



TO92

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	100	V
Collector-Emitter Voltage	V_{CEO}	100	V
Emitter-Base Voltage	V_{EBO}	12	V
Continuous Collector Current	I_C	1	A
Power Dissipation at T_{amb}=25°C	P_{tot}	625	mW
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +150	°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C).

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	100			V	I_C=100µA, I_E=0
Collector-Emitter Breakdown Voltage	$V_{(BR)CES}$	100			V	I_C=100µA, I_B=0*
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	12			V	I_E=10µA, I_C=0
Collector Cut-Off Current	I_{CBO}			100	nA	V_{CB}=80V, I_E=0
Emitter Cut-Off Current	I_{EBO}			100	nA	V_{EB}=10V, I_C=0
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$			1.0	V	I_C=250mA, I_B=0.25mA
Base-Emitter Saturation Voltage	$V_{BE(sat)}$			2	V	I_C=250mA, I_B=0.25mA
Static Forward Current Transfer Ratio	h_{FE}	10K 8K				I_C=100mA, V_{CE}=5V* I_C=250mA, V_{CE}=5V*
Transition Frequency	f_T	100			MHz	I_C=100mA, V_{CE}=5V f=100MHz
Output Capacitance	C_{obo}			25	pF	V_{CB}=10V, f=1MHz

*Measured under pulsed conditions. Pulse width =300µs. Duty cycle ≤ 2%

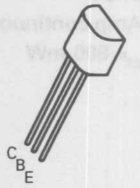
NPN SILICON PLANAR MEDIUM POWER DARLINGTON TRANSISTOR

BC372P

ISSUE 2 – SEPT 93

FEATURES

- * 100 Volt V_{CEO}
- * Gain of 8k at I_C=250mA
- * P_{tot}=1 Watt



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	100	V
Collector-Emitter Voltage	V_{CEO}	100	V
Emitter-Base Voltage	V_{EBO}	12	V
Peak Pulse Current	I_{CM}	2	A
Continuous Collector Current	I_C	1	A
Power Dissipation at T_{amb}=25°C	P_{tot}	1	W
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +200	°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C).

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	100			V	I_C=100µA, I_E=0
Collector-Emitter Breakdown Voltage	$V_{(BR)CES}$	100			V	I_C=100µA, I_B=0*
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	12			V	I_E=10µA, I_C=0
Collector Cut-Off Current	I_{CBO}			100	nA	V_{CB}=80V, I_E=0
Emitter Cut-Off Current	I_{EBO}			100	nA	V_{EB}=10V, I_C=0
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$			1.1	V	I_C=250mA, I_B=0.25mA
Base-Emitter Saturation Voltage	$V_{BE(sat)}$			2	V	I_C=250mA, I_B=0.25mA
Static Forward Current Transfer Ratio	h_{FE}	10K 8K				I_C=100mA, V_{CE}=5V* I_C=250mA, V_{CE}=5V*
Transition Frequency	f_T	100			MHz	I_C=100mA, V_{CE}=5V f=100MHz
Output Capacitance	C_{obo}			25	pF	V_{CB}=10V, f=1MHz

*Measured under pulsed conditions. Pulse width =300µs. Duty cycle ≤ 2%

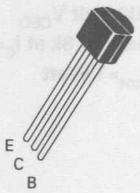
NPN SILICON PLANAR MEDIUM POWER TRANSISTOR

BC639

ISSUE 1 – SEPT 93

FEATURES

- * 1 Amp continuous current
- * P_{tot}= 800 mW



TO92

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	80	V
Collector-Emitter Voltage	V_{CEO}	80	V
Emitter-Base Voltage	V_{EBO}	5	V
Continuous Collector Current	I_C	1	A
Power Dissipation at T_{amb}=25°C	P_{tot}	800	mW
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +150	°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	80			V	I_C=100µA, I_E=0
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	80			V	I_C=10mA, I_B=0*
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	5			V	I_E=10µA, I_C=0
Collector Cut-Off Current	I_{CBO}			0.1	µA	V_{CB}=30V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$			0.5	V	I_C=500mA, I_B=50mA*
Base-Emitter Turn-on Voltage	$V_{BE(on)}$			1.0	V	I_C=500mA,V_{CE}=2V*
Static Forward Current Transfer Ratio	h_{FE}	25 40 25		 160 		I_C=5mA, V_{CE}=2V* I_C=150mA, V_{CE}=2V* I_C=500mA, V_{CE}=2V*
Transition Frequency	f_T		200		MHz	I_C=50mA, V_{CE}=2V f=100MHz

*Measured under pulsed conditions. Pulse width=300µs. Duty cycle ≤ 2%

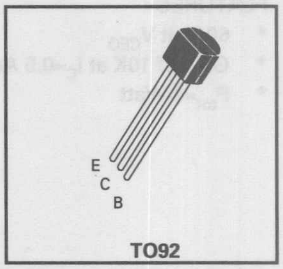
PNP SILICON PLANAR MEDIUM POWER TRANSISTOR

BC640

ISSUE 1 – SEPT 93

FEATURES

- * 1 Amp continuous current
- * P_{tot}= 800 mW



ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	-80	V
Collector-Emitter Voltage	V_{CEO}	-80	V
Emitter-Base Voltage	V_{EBO}	-5	V
Continuous Collector Current	I_C	-1	A
Power Dissipation at T_{amb}=25°C	P_{tot}	800	mW
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +150	°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	-80			V	I_C=-100µA, I_E=0
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	-80			V	I_C=-10mA, I_B=0*
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	-5			V	I_E=-10µA, I_C=0
Collector Cut-Off Current	I_{CBO}			-0.1	µA	V_{CB}=-30V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$			-0.5	V	I_C=-500mA, I_B=-50mA*
Base-Emitter Turn-on Voltage	$V_{BE(on)}$			-1.0	V	I_C=-500mA,V_{CE}=-2V*
Static Forward Current Transfer Ratio	h_{FE}	25				I_C=-5mA, V_{CE}=-2V*
		40		160		I_C=-150mA, V_{CE}=-2V*
		25				I_C=-500mA, V_{CE}=-2V*
Transition Frequency	f_T		200		MHz	I_C=-50mA, V_{CE}=-2V f=100MHz

*Measured under pulsed conditions. Pulse width=300µs. Duty cycle ≤ 2%

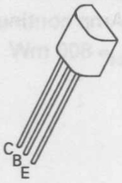
NPN SILICON PLANAR MEDIUM POWER DARLINGTON TRANSISTORS

BCX38A/B/C

ISSUE 1 – MARCH 94

FEATURES

- * 60 Volt V_{CEO}
- * Gain of 10K at I_C=0.5 Amp
- * P_{tot}=1 Watt



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

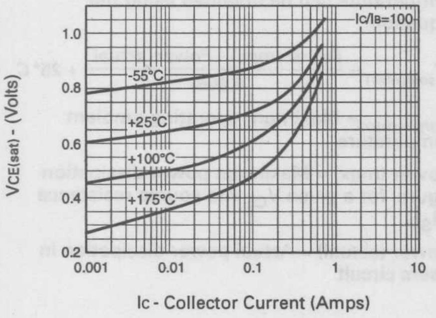
PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	80	V
Collector-Emitter Voltage	V_{CEO}	60	V
Emitter-Base Voltage	V_{EBO}	10	V
Peak Pulse Current	I_{CM}	2	A
Continuous Collector Current	I_C	800	mA
Power Dissipation at T_{amb}=25°C	P_{tot}	1	W
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +200	°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C).

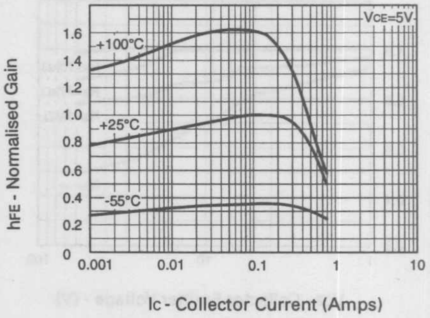
PARAMETER		SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage		$V_{(BR)CBO}$	80			V	I_C=10μA, I_E=0
Collector-Emitter Sustaining Voltage		$V_{CEO(sus)}$	60			V	I_C=10mA, I_B=0
Emitter-Base Breakdown Voltage		$V_{(BR)EBO}$	10			V	I_E=10μA, I_C=0
Collector Cut-Off Current		I_{CBO}			100	nA	V_{CB}=60V, I_E=0
Emitter Cut-Off Current		I_{EBO}			100	nA	V_{EB}=8V, I_C=0
Collector-Emitter Saturation Voltage		$V_{CE(sat)}$			1.25	V	I_C=800mA, I_B=8mA*
Base-Emitter Turn-on Voltage		$V_{BE(on)}$			1.8	V	I_C=800mA, V_{CE}=5V*
Static Forward Current Transfer Ratio	BCX38A	h_{FE}	500 1000				I_C=100mA, V_{CE}=5V* I_C=500mA, V_{CE}=5V*
	BCX38B		2000 4000				I_C=100mA, V_{CE}=5V* I_C=500mA, V_{CE}=5V*
	BCX38C		5000 10000				I_C=100mA, V_{CE}=5V* I_C=500mA, V_{CE}=5V*

*Measured under pulsed conditions. Pulse width=300μs. Duty cycle ≤ 2%

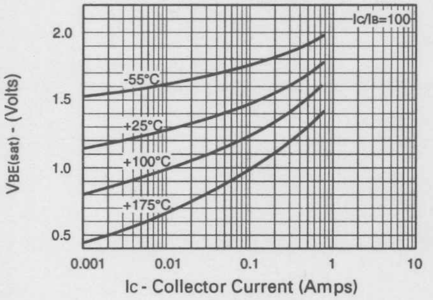
TYPICAL CHARACTERISTICS



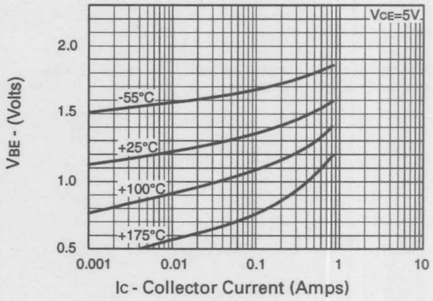
VCE(sat) v IC



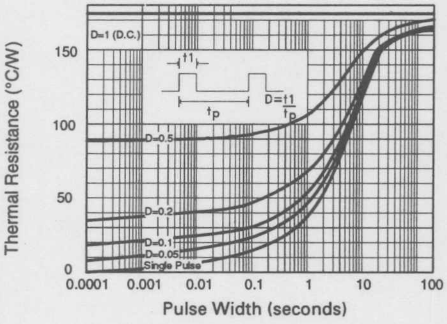
hFE v IC



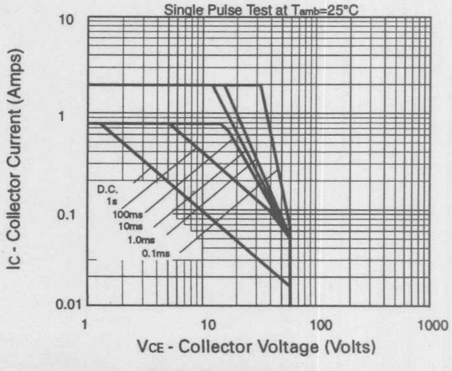
VBE(sat) v IC



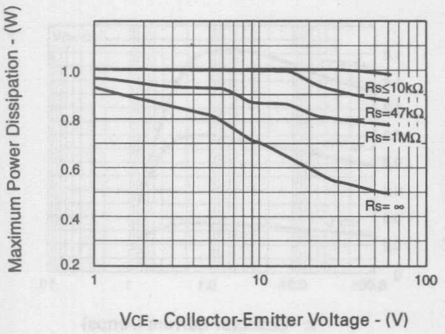
VBE(on) v IC



Maximum transient thermal impedance



Safe Operating Area



The maximum permissable operational temperature can be obtained using the equation:

$$T_{amb(max)} = \frac{Power(max) - Power(actual)}{0.0057} + 25^\circ C$$

$T_{amb(max)}$= Maximum operating ambient temperature

Power (max) = Maximum power dissipation figure, for a given V_{CE} and source resistance (R_S)

Power (actual) = Actual power dissipation in users circuit

N-CHANNEL ENHANCEMENT MODE VERTICAL DMOS FET

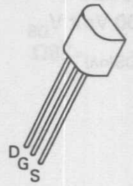
BS107P

ISSUE 2 – SEPT 93

FEATURES

- 200 Volt V_{DS}
- $R_{DS(on)}=23\Omega$

REFER TO BS107PT FOR GRAPHS



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Drain-Source Voltage	V_{DS}	200	V
Continuous Drain Current at T_{amb}=25°C	I_D	0.12	A
Pulsed Drain Current	I_{DM}	2	A
Gate-Source Voltage	V_{GS}	±20	V
Power Dissipation at T_{amb}=25°C	P_{tot}	500	mW
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +150	°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C)

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Drain-Source Breakdown Voltage	BV_{DSS}	200	230		V	I_D=100μA, V_{GS}=0V
Gate Body Leakage	I_{GSS}			10	nA	V_{GS}=15V, V_{DS}=0V
Drain Cut-Off Current	I_{DSS}			30	nA	V_{GS}=0V, V_{DS}=130V
Drain Cut-Off Current	I_{DSX}			1	μA	V_{GS}=0.2V, V_{DS}=70V
Static Drain-Source on-State Resistance	$R_{DS(on)}$		15	23 30	Ω Ω	V_{GS}=2.6V, I_D=25mA* V_{GS}=5V, I_D=100mA*

* Measured under pulsed conditions. Pulse width=300μs. Duty cycle ≤ 2%

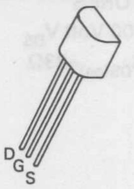
N-CHANNEL ENHANCEMENT MODE VERTICAL DMOS FET

BS107PT

ISSUE 2 – SEPT 93

FEATURES

- * 200 Volt V_{DS}
- * $R_{DS(on)}$=28Ω



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

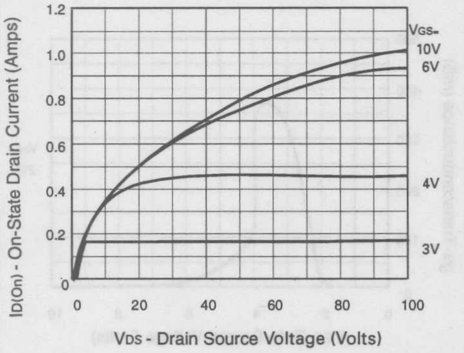
PARAMETER	SYMBOL	VALUE	UNIT
Drain-Source Voltage	V_{DS}	200	V
Continuous Drain Current at T_{amb}=25°C	I_D	0.12	A
Pulsed Drain Current	I_{DM}	2	A
Gate-Source Voltage	V_{GS}	±20	V
Power Dissipation at T_{amb}=25°C	P_{tot}	500	mW
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +150	°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C)

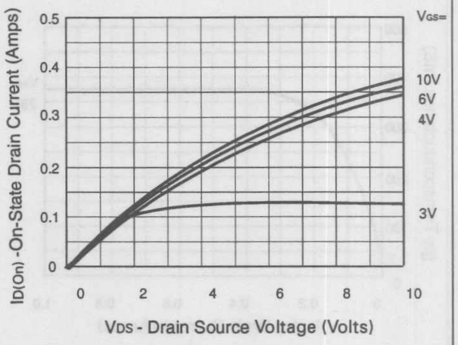
PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Drain-Source Breakdown Voltage	BV_{DSS}	200	230		V	I_D=100μA, V_{GS}=0V
Gate Body Leakage	I_{GSS}			10	nA	V_{GS}=15V, V_{DS}=0V
Drain Cut-Off Current	I_{DSS}			30	nA	V_{GS}=0V, V_{DS}=130V
Drain Cut-Off Current	I_{DSX}			1	μA	V_{GS}=0.2V, V_{DS}=70V
Static Drain-Source on-State Resistance	$R_{DS(on)}$		15	28 30	Ω Ω	V_{GS}=2.6V, I_D=20mA* V_{GS}=2.7V, I_D=100mA*

* Measured under pulsed conditions. Pulse width=300μs. Duty cycle ≤ 2%

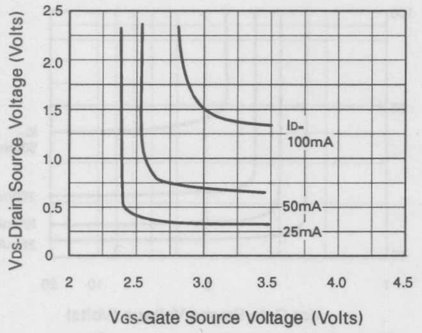
TYPICAL CHARACTERISTICS



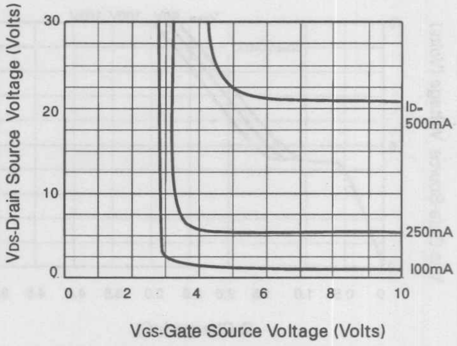
Output Characteristics



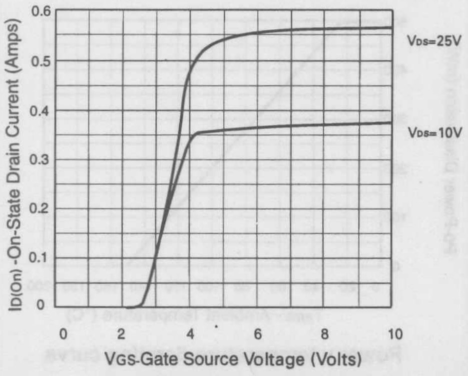
Saturation Characteristics



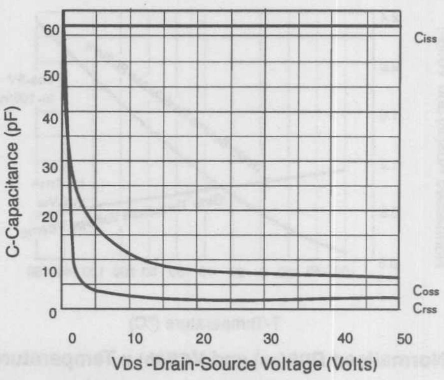
Voltage Saturation Characteristics



Voltage Saturation Characteristics

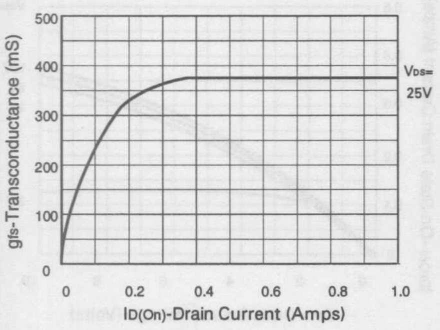


Transfer characteristics

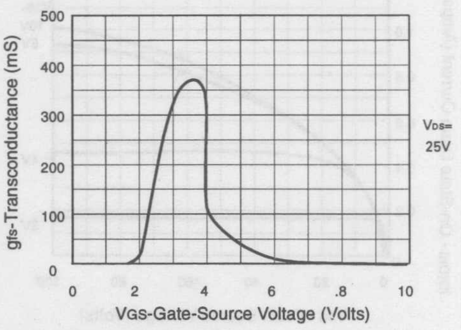


Capacitance v drain-source voltage

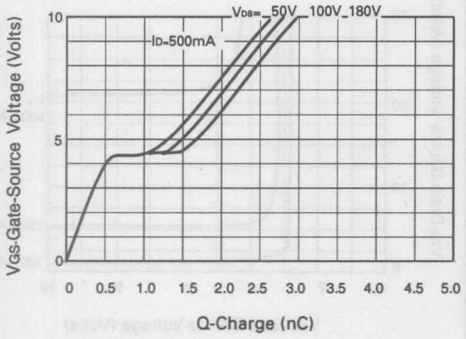
TYPICAL CHARACTERISTICS



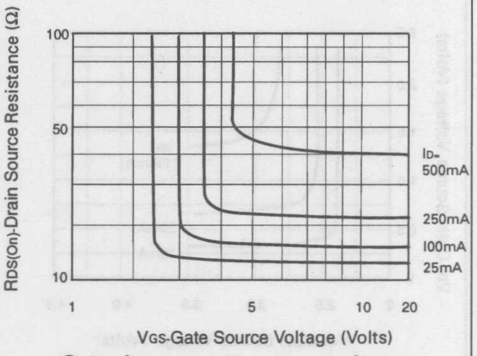
Transconductance v drain current



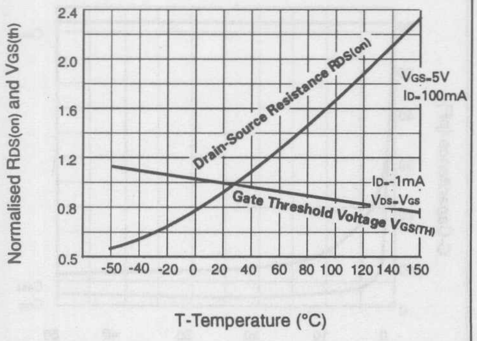
Transconductance v gate-source voltage



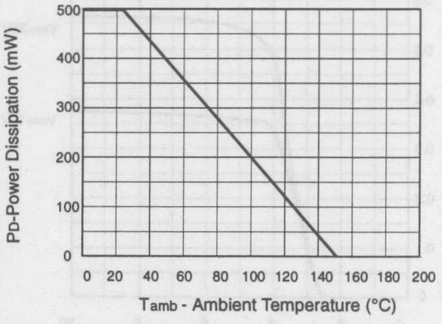
Gate charge v gate-source voltage



Gate charge v gate-source voltage



Normalised RDS(on) and VGS(th) v Temperature



Power v temperature derating curve

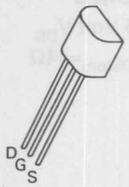
N-CHANNEL ENHANCEMENT MODE VERTICAL DMOS FET

BS170P

ISSUE 2 – SEPT 93

FEATURES

- 60 Volt V_{DS}
- $R_{DS(on)}$=5Ω



E-Line
TO92 Compatible

REFER TO ZVN3306A FOR GRAPHS

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Drain-Source Voltage	V_{DS}	60	V
Continuous Drain Current at T_{amb}=25°C	I_D	270	mA
Pulsed Drain Current	I_{DM}	3	A
Gate-Source Voltage	V_{GS}	±20	V
Power Dissipation at T_{amb}=25°C	P_{tot}	625	mW
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +150	°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C).

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Drain-Source Breakdown Voltage	BV_{DSS}	60			V	I_D=100μA, V_{GS}=0V
Gate-Source Threshold Voltage	$V_{GS(th)}$	0.8		3	V	I_D=1mA, V_{DS}=V_{GS}
Gate Body Leakage	I_{GSS}			10	nA	V_{GS}=15V, V_{DS}=0V
Zero Gate Voltage Drain Current	I_{DSS}			0.5	μA	V_{GS}=0V, V_{DS}=25V
Static Drain-Source on-State Resistance (1)	$R_{DS(on)}$			5	Ω	V_{GS}=10V, I_D=200mA
Forward Transconductance (1)(2)	g_{fs}		200		mS	V_{DS}=10V, I_D=200mA
Input Capacitance (2)	C_{iss}		60		pF	V_{GS}=0V, V_{DS}=10V f=1MHz
Turn-On Time (2)(3)	$t_{(on)}$			10	ns	V_{DD}≈15V, I_D=600mA
Turn-Off Time (2)(3)	$t_{(off)}$			10	ns	

(1) Measured under pulsed conditions. Pulse width=300μs. Duty cycle ≤ 2% (2) Sample test
(3) Switching times measured with a 50Ω source impedance and <5ns rise time on a pulse generator

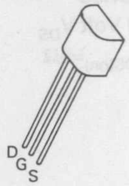
P-CHANNEL ENHANCEMENT MODE VERTICAL DMOS FET

BS250P

ISSUE 2 – SEPT 93

FEATURES

- 45 Volt V_{DS}
- $R_{DS(on)}$=14Ω



E-Line
TO92 Compatible

REFER TO ZVP2106A FOR GRAPHS

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Drain-Source Voltage	V_{DS}	-45	V
Continuous Drain Current at T_{amb}=25°C	I_D	-230	mA
Pulsed Drain Current	I_{DM}	-3	A
Gate-Source Voltage	V_{GS}	±20	V
Power Dissipation at T_{amb}=25°C	P_{tot}	700	mW
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +150	°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C).

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Drain-Source Breakdown Voltage	BV_{DSS}	-45			V	I_D=-100µA, V_{GS}=0V
Gate-Source Threshold Voltage	$V_{GS(th)}$	-1		-3.5	V	I_D=-1mA, V_{DS}=V_{GS}
Gate Body Leakage	I_{GSS}			-20	nA	V_{GS}=-15V, V_{DS}=0V
Zero Gate Voltage Drain Current	I_{DSS}			-500	nA	V_{GS}=0V, V_{DS}=-25V
Static Drain-Source on-State Resistance (1)	$R_{DS(on)}$			14	Ω	V_{GS}=-10V, I_D=-200mA
Forward Transconductance (1)(2)	g_{fs}		150		mS	V_{DS}=-10V, I_D=-200mA
Input Capacitance (2)	C_{iss}		60		pF	V_{GS}=0V, V_{DS}=-10V f=1MHz
Turn-On Time (2)(3)	$t_{(on)}$			20	ns	V_{DD}=-25V, I_D=-500mA
Turn-Off Time (2)(3)	$t_{(off)}$			20	ns	

(1) Measured under pulsed conditions. Pulse width=300µs. Duty cycle ≤ 2% (2) Sample test
(3) Switching times measured with a 50Ω source impedance and <5ns rise time on a pulse generator

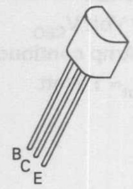
NPN SILICON PLANAR MEDIUM POWER DARLINGTON TRANSISTOR

FXT38C

ISSUE 1 – SEPT 93

FEATURES

- 60 Volt V_{CEO}
- Gain of 10K at I_C=0.5 Amp



E-Line
TO92 Compatible

REFER TO BCX38 FOR GRAPHS

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	80	V
Collector-Emitter Voltage	V_{CEO}	60	V
Emitter-Base Voltage	V_{EBO}	10	V
Peak Pulse Current	I_{CM}	2	A
Continuous Collector Current	I_C	800	mA
Power Dissipation at T_{amb}=25°C	P_{tot}	1	W
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +200	°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C).

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	80			V	I_C=10μA, I_E=0
Collector-Emitter Sustaining Voltage	$V_{CEO(sus)}$	60			V	I_C=10mA, I_B=0
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	10			V	I_E=10μA, I_C=0
Collector Cut-Off Current	I_{CBO}			100	nA	V_{CB}=60V, I_E=0
Emitter Cut-Off Current	I_{EBO}			100	nA	V_{EB}=8V, I_C=0
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$			1.25	V	I_C=800mA, I_B=8mA*
Base-Emitter Turn-On Voltage	$V_{BE(on)}$			1.8	V	I_C=800mA, V_{CE}=5V*
Static Forward Current Transfer Ratio	h_{FE}	5000 10000				I_C=100mA, V_{CE}=5V* I_C=500mA, V_{CE}=5V*

* Measured under pulsed conditions. Pulse width=300μs. Duty cycle ≤ 2%

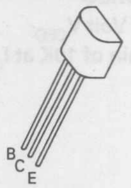
NPN SILICON PLANAR
MEDIUM POWER TRANSISTOR

FXT449

ISSUE 1 – SEPT 93

FEATURES

- 30 Volt V_{CEO}
- 1 Amp continuous current
- P_{tot}= 1 Watt



E-Line
TO92 Compatible

REFER TO ZTX449 FOR GRAPHS

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	50	V
Collector-Emitter Voltage	V_{CEO}	30	V
Emitter-Base Voltage	V_{EBO}	5	V
Peak Pulse Current	I_{CM}	2	A
Continuous Collector Current	I_C	1	A
Power Dissipation at T_{amb}=25°C	P_{tot}	1	W
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +200	°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	50			V	I_C=100μA, I_E=0
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	30			V	I_C=10mA, I_B=0*
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	5			V	I_E=100μA, I_C=0
Collector Cut-Off Current	I_{CBO}			0.1 10	μA μA	V_{CB}=40V V_{CB}=40V, T_{amb}=100°C
Emitter Cut-Off Current	I_{EBO}			0.1	μA	V_{EB}=4V, I_C=0
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$			0.5 1	V V	I_C=1A, I_B=100mA* I_C=2A, I_B=200mA*
Base-Emitter Saturation Voltage	$V_{BE(sat)}$			1.25	V	I_C=1A, I_B=100mA*
Base-Emitter Turn-on Voltage	$V_{BE(on)}$			1	V	I_C=1A,V_{CE}=2V*
Static Forward Current Transfer Ratio	h_{FE}	70 100 80 40		 300		I_C=50mA, V_{CE}=2V* I_C=500mA, V_{CE}=2V* I_C=1A, V_{CE}=2V* I_C=2A, V_{CE}=2V*
Transition Frequency	f_T	150			MHz	I_C=50mA, V_{CE}=10V f=100MHz
Output Capacitance	C_{obo}			15	pF	V_{CB}=10V, f=1MHz

*Measured under pulsed conditions. Pulse width=300μs. Duty cycle ≤ 2%

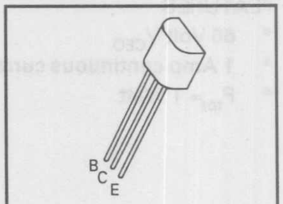
NPN SILICON PLANAR MEDIUM POWER TRANSISTOR

FXT450

ISSUE 1 – SEPT 93

FEATURES

- 45 Volt V_{CEO}
- 1 Amp continuous current
- P_{tot}=1 Watt



E-Line
TO92 Compatible

REFER TO ZTX450 FOR GRAPHS

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	60	V
Collector-Emitter Voltage	V_{CEO}	45	V
Emitter-Base Voltage	V_{EBO}	5	V
Peak Pulse Current	I_{CM}	2	A
Continuous Collector Current	I_C	1	A
Power Dissipation at T_{amb}=25°C	P_{tot}	1	W
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +200	°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C).

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	60			V	I_C=100μA, I_E=0
Collector-Emitter Sustaining Voltage	$V_{CEO(SUS)}$	45			V	I_C=10mA, I_B=0*
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	5			V	I_E=100μA, I_C=0
Collector Cut-Off Current	I_{CBO}			0.1	μA	V_{CB}=45V, I_E=0
Emitter Cut-Off Current	I_{EBO}			0.1	μA	V_{EB}=4V, I_C=0
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$			0.25	V	I_C=150mA, I_B=15mA*
Base-Emitter Saturation Voltage	$V_{BE(sat)}$			1.1	V	I_C=150mA, I_B=15mA*
Static Forward Current Transfer Ratio	h_{FE}	100 15		300		I_C=150mA, V_{CE}=10V* I_C=1A, V_{CE}=10V*
Transition Frequency	f_T	150				I_C=50mA, V_{CE}=10V f=100MHz
Output Capacitance	C_{obo}			15	pF	V_{CB}=10V, f=1MHz

*Measured under pulsed conditions. Pulse width=300μs. Duty cycle ≤ 2%

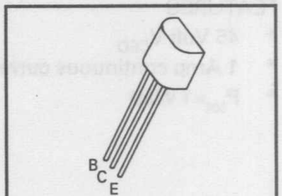
NPN SILICON PLANAR
MEDIUM POWER TRANSISTOR

FXT451

ISSUE 1 – SEPT 93

FEATURES

- * 60 Volt V_{CEO}
- * 1 Amp continuous current
- * P_{tot}= 1 Watt



E-Line
TO92 Compatible

REFER TO ZTX451 FOR GRAPHS

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	80	V
Collector-Emitter Voltage	V_{CEO}	60	V
Emitter-Base Voltage	V_{EBO}	5	V
Peak Pulse Current	I_{CM}	2	A
Continuous Collector Current	I_C	1	A
Power Dissipation at T_{amb}=25°C	P_{tot}	1	W
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +200	°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C).

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	80			V	I_C=100μA, I_E=0
Collector-Emitter Sustaining Voltage	$V_{CEO(sus)}$	60			V	I_C=10mA, I_B=0*
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	5			V	I_E=100μA, I_C=0
Collector Cut-Off Current	I_{CBO}			0.1	μA	V_{CB}=60V, I_E=0
Emitter Cut-Off Current	I_{EBO}			0.1	μA	V_{EB}=4V, I_C=0
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$			0.35	V	I_C=150mA, I_B=15mA*
Base-Emitter Saturation Voltage	$V_{BE(sat)}$			1.1	V	I_C=150mA, I_B=15mA*
Static Forward Current Transfer Ratio	h_{FE}	50 10		150		I_C=150mA, V_{CE}=10V* I_C=1A, V_{CE}=10V*
Transition Frequency	f_T	150			MHz	I_C=50mA, V_{CE}=10V f=100MHz
Output Capacitance	C_{obo}			15	pF	V_{CB}=10V, f=1MHz

*Measured under pulsed conditions. Pulse width=300μs. Duty cycle ≤ 2%

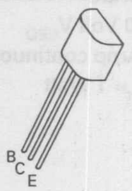
NPN SILICON PLANAR MEDIUM POWER TRANSISTOR

FXT453

ISSUE 1 – SEPT 93

FEATURES

- 100 Volt V_{CEO}
- 1 Amp continuous current
- P_{tot}= 1 Watt



E-Line
TO92 Compatible

REFER TO ZTX453 FOR GRAPHS

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	120	V
Collector-Emitter Voltage	V_{CEO}	100	V
Emitter-Base Voltage	V_{EBO}	5	V
Peak Pulse Current	I_{CM}	2	A
Continuous Collector Current	I_C	1	A
Power Dissipation at T_{amb}=25°C	P_{tot}	1	W
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +200	°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C).

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	120			V	I_C=100μA, I_E=0
Collector-Emitter Sustaining Voltage	$V_{CEO(sus)}$	100			V	I_C=10mA, I_B=0*
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	5			V	I_E=100μA, I_C=0
Collector Cut-Off Current	I_{CBO}			0.1	μA	V_{CB}=100V, I_E=0
Emitter Cut-Off Current	I_{EBO}			0.1	μA	V_{EB}=4V, I_C=0
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$			0.7	V	I_C=150mA, I_B=15mA*
Base-Emitter Saturation Voltage	$V_{BE(sat)}$			1.3	V	I_C=150mA, I_B=15mA*
Static Forward Current Transfer Ratio	h_{FE}	40 10		200		I_C=150mA, V_{CE}=10V* I_C=1A, V_{CE}=10V*
Transition Frequency	f_T	150			MHz	I_C=50mA, V_{CE}=10V f=100MHz
Output Capacitance	C_{obo}			15	pF	V_{CB}=10V, f=1MHz

*Measured under pulsed conditions. Pulse width=300μs. Duty cycle ≤ 2%

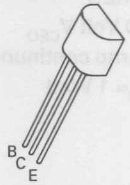
NPN SILICON PLANAR MEDIUM POWER TRANSISTOR

FXT455

ISSUE 1 – SEPT 93

FEATURES

- 140 Volt V_{CEO}
- 1 Amp continuous current
- P_{tot}= 1 Watt



E-Line

TO92 Compatible

REFER TO ZTX455 FOR GRAPHS

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	160	V
Collector-Emitter Voltage	V_{CEO}	140	V
Emitter-Base Voltage	V_{EBO}	5	V
Peak Pulse Current	I_{CM}	2	A
Continuous Collector Current	I_C	1	A
Power Dissipation at T_{amb}=25°C	P_{tot}	1	W
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +200	°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C).

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	160			V	I_C=100μA, I_E=0
Collector-Emitter Sustaining Voltage	$V_{CEO(sus)}$	140			V	I_C=10mA, I_B=0*
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	5			V	I_E=100μA, I_C=0
Collector Cut-Off Current	I_{CBO}			0.1	μA	V_{CB}=140V, I_E=0
Emitter Cut-Off Current	I_{EBO}			0.1	μA	V_{EB}=4V, I_C=0
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$			0.7	V	I_C=150mA, I_B=15mA*
Static Forward Current Transfer Ratio	h_{FE}	100	 10	300		I_C=150mA, V_{CE}=10V* I_C=1A, V_{CE}=10V*
Transition Frequency	f_T	100			MHz	I_C=50mA, V_{CE}=10V f=100MHz
Output Capacitance	C_{obo}			15	pF	V_{CB}=10V, f=1MHz

*Measured under pulsed conditions. Pulse width=300μs. Duty cycle ≤ 2%

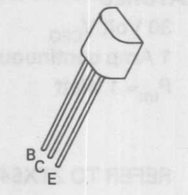
NPN SILICON PLANAR MEDIUM POWER HIGH VOLTAGE TRANSISTOR

FXT458

ISSUE 1 – SEPTEMBER 1994

FEATURES

- 400 Volt V_{CEO}
- 0.5 Amp continuous current
- P_{tot}= 1 Watt



E-Line
TO92 Compatible

REFER TO ZTX458 FOR GRAPHS

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	400	V
Collector-Emitter Voltage	V_{CEO}	400	V
Emitter-Base Voltage	V_{EBO}	5	V
Continuous Collector Current	I_C	300	mA
Power Dissipation at T_{amb}=25°C	P_{tot}	1	W
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +200	°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C).

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	400			V	I_C=100μA
Collector-Emitter Breakdown Voltage	$V_{CEO(sus)}$	400			V	I_C=10mA*
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	5			V	I_E=100μA
Collector Cut-Off Current	I_{CBO}			100	nA	V_{CB}=320V
Collector Cut-Off Current	I_{CES}			100	nA	V_{CE}=320V
Emitter Cut-Off Current	I_{EBO}			100	nA	V_{EB}=4V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$			0.2 0.5	V V	I_C=20mA, I_B=2mA I_C=50mA, I_B=6mA
Base-Emitter Saturation Voltage	$V_{BE(sat)}$			0.9	V	I_C=50mA, I_B=5mA
Base-Emitter Turn On Voltage	$V_{BE(on)}$			0.9	V	I_C=50mA, V_{CE}=10V
Static Forward Current Transfer Ratio	h_{FE}	100 100 15		 300 		I_C=1mA, V_{CE}=10V I_C=50mA, V_{CE}=10V I_C=100mA, V_{CE}=10V*
Transition Frequency	f_T	50			MHz	I_C=10mA, V_{CE}=20V f=20MHz
Collector-Base Breakdown Voltage	C_{obo}			5	pF	V_{CB}=20V, f=1MHz
Switching times	t_{on} t_{off}		135 2260		ns ns	I_C=50mA, V_C=100V I_{B1}=5mA, I_{B2}=-10mA

*Measured under pulsed conditions. Pulse width=300μs. Duty cycle ≤ 2%

PNP SILICON PLANAR MEDIUM POWER TRANSISTOR

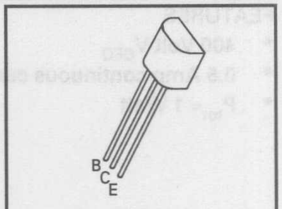
FXT549

ISSUE 1 – SEPT 93

FEATURES

- 30 Volt V_{CEO}
- 1 Amp continuous current
- P_{tot}= 1 Watt

REFER TO ZTX549 FOR GRAPHS



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	-35	V
Collector-Emitter Voltage	V_{CEO}	-30	V
Emitter-Base Voltage	V_{EBO}	-5	V
Peak Pulse Current	I_{CM}	-2	A
Continuous Collector Current	I_C	-1	A
Power Dissipation at T_{amb}=25°C	P_{tot}	1	W
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +200	°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	-35			V	I_C=-100μA, I_E=0
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	-30			V	I_C=-10mA, I_B=0*
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	-5			V	I_E=-100μA, I_C=0
Collector Cut-Off Current	I_{CBO}			-0.1	μA	V_{CB}=-30V
				-10	μA	V_{CB}=-30V, T_{amb}=100°C
Emitter Cut-Off Current	I_{EBO}			-0.1	μA	V_{EB}=-4V, I_C=0
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$		-0.25	-0.50	V	I_C=-1A, I_B=-100mA*
			-0.50	-0.75	V	I_C=-2A, I_B=-200mA*
Base-Emitter Saturation Voltage	$V_{BE(sat)}$		-0.90	-1.25	V	I_C=-1A, I_B=-100mA*
Base-Emitter Turn-On Voltage	$V_{BE(on)}$		-0.85	-1	V	I_C=-1A, V_{CE}=-2V*
Static Forward Current Transfer Ratio	h_{FE}	70	200			I_C=-50mA, V_{CE}=-2V*
		100	160	300		I_C=-500mA, V_{CE}=-2V*
		80	130			I_C=-1A, V_{CE}=-2V*
		40	80			I_C=-2A, V_{CE}=-2V*
Transition Frequency	f_T	100			MHz	I_C=-100mA, V_{CE}=-5V f=100MHz
Output Frequency	C_{obo}			25	pF	V_{CB}=-10V, f=1MHz

* Measured under pulsed conditions. Pulse width=300μs. Duty cycle ≤ 2%

PNP SILICON PLANAR
MEDIUM POWER TRANSISTOR

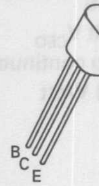
ISSUE 1 – SEPT 93

FXT550

FEATURES

- 45 Volt V_{CEO}
- 1 Amp continuous current
- P_{tot}= 1 Watt

REFER TO ZTX550 FOR GRAPHS



E-Line

TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	-60	V
Collector-Emitter Voltage	V_{CEO}	-45	V
Emitter-Base Voltage	V_{EBO}	-5	V
Peak Pulse Current	I_{CM}	-2	A
Continuous Collector Current	I_C	-1	A
Power Dissipation at T_{amb}=25°C	P_{tot}	1	W
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +200	°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C).

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	-60			V	I_C=-100μA, I_E=0
Collector-Emitter Sustaining Voltage	$V_{CEO(sus)}$	-45			V	I_C=-10mA, I_B=0*
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	-5			V	I_E=-100μA, I_C=0
Collector Cut-Off Current	I_{CBO}			-0.1	μA	V_{CB}=-45V, I_E=0
Emitter Cut-Off Current	I_{EBO}			-0.1	μA	V_{EB}=-4V, I_C=0
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$			-0.25	V	I_C=-150mA, I_B=-15mA*
Base-Emitter Saturation Voltage	$V_{BE(sat)}$			-1.1	V	I_C=-150mA, I_B=-15mA*
Static Forward Current Transfer Ratio	h_{FE}	100 15		300		I_C=-150mA, V_{CE}=-10V* I_C=-1A, V_{CE}=-10V*
Transition Frequency	f_T	150			MHz	I_C=-50mA, V_{CE}=-10V f=100MHz
Output Capacitance	C_{obo}			25	pF	V_{CB}=-10V,f=1MHz

*Measured under pulsed conditions. Pulse width=300μs. Duty cycle ≤ 2%

PNP SILICON PLANAR MEDIUM POWER TRANSISTOR

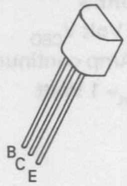
FXT551

ISSUE 1 – SEPT 93

FEATURES

- 60 Volt V_{CEO}
- 1 Amp continuous current
- P_{tot}= 1 Watt

REFER TO ZTX551 FOR GRAPHS



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	-80	V
Collector-Emitter Voltage	V_{CEO}	-60	V
Emitter-Base Voltage	V_{EBO}	-5	V
Peak Pulse Current	I_{CM}	-2	A
Continuous Collector Current	I_C	-1	A
Power Dissipation at T_{amb}=25°C	P_{tot}	1	W
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +200	°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C).

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	-80			V	I_C=-100μA, I_E=0
Collector-Emitter Sustaining Voltage	$V_{CEO(sus)}$	-60			V	I_C=-10mA, I_B=0*
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	-5			V	I_E=-100μA, I_C=0
Collector Cut-Off Current	I_{CBO}			-0.1	μA	V_{CB}=-60V, I_E=0
Emitter Cut-Off Current	I_{EBO}			-0.1	μA	V_{EB}=-4V, I_C=0
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$			-0.35	V	I_C=-150mA, I_B=-15mA*
Base-Emitter Saturation Voltage	$V_{BE(sat)}$			-1.1	V	I_C=-150mA, I_B=-15mA*
Static Forward Current Transfer Ratio	h_{FE}	50 10		150		I_C=-150mA, V_{CE}=-10V* I_C=-1A, V_{CE}=-10V*
Transition Frequency	f_T	150			MHz	I_C=-50mA, V_{CE}=-10V f=100MHz
Output Capacitance	C_{obo}			25	pF	V_{CB}=-10V, f=1MHz

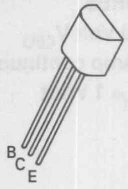
*Measured under pulsed conditions. Pulse width=300μs. Duty cycle ≤ 2%

PNP SILICON PLANAR MEDIUM POWER TRANSISTOR

FXT553

ISSUE 1 – FEB 94

FEATURES
- 100 Volt V_{CEO}
- 1 Amp continuous current
- P_{tot}= 1 Watt



E-Line
TO92 Compatible

REFER TO ZTX553 FOR GRAPHS

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	-120	V
Collector-Emitter Voltage	V_{CEO}	-100	V
Emitter-Base Voltage	V_{EBO}	-5	V
Peak Pulse Current	I_{CM}	-2	A
Continuous Collector Current	I_C	-1	A
Power Dissipation at T_{amb}=25°C	P_{tot}	1	W
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +200	°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C).

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	-120			V	I_C=-100μA, I_E=0
Collector-Emitter Sustaining Voltage	$V_{CEO(sus)}$	-100			V	I_C=-10mA, I_B=0*
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	-5			V	I_E=-100μA, I_C=0
Collector Cut-Off Current	I_{CBO}			-0.1	μA	V_{CB}=-100V, I_E=0
Emitter Cut-Off Current	I_{EBO}			-0.1	μA	V_{EB}=-4V, I_C=0
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$			-0.25	V	I_C=-150mA, I_B=-15mA*
Base-Emitter Saturation Voltage	$V_{BE(sat)}$			-1.1	V	I_C=-150mA, I_B=-15mA*
Base-Emitter Turn-on Voltage	$V_{BE(on)}$			-1	V	I_C=-150mA, V_{CE}=-10V
Static Forward Current Transfer Ratio	h_{FE}	40 10		200		I_C=-150mA, V_{CE}=-10V* I_C=-1A, V_{CE}=-10V*
Transition Frequency	f_T	150			MHz	I_C=-50mA, V_{CE}=-10V f=100MHz
Output Capacitance	C_{obo}			12	pF	V_{CB}=-10V, f=1MHz

*Measured under pulsed conditions. Pulse width=300μs. Duty cycle ≤ 2%

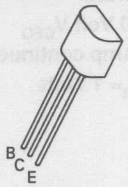
PNP SILICON PLANAR MEDIUM POWER TRANSISTOR

FXT555

ISSUE 1 – MARCH 94

FEATURES

- 150 Volt V_{CEO}
- 1 Amp continuous current
- P_{tot}= 1 Watt



E-Line

TO92 Compatible

REFER TO ZTX555 FOR GRAPHS

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	-160	V
Collector-Emitter Voltage	V_{CEO}	-150	V
Emitter-Base Voltage	V_{EBO}	-5	V
Peak Pulse Current	I_{CM}	-2	A
Continuous Collector Current	I_C	-1	A
Power Dissipation at T_{amb}=25°C	P_{tot}	1	W
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +200	°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	-160			V	I_C=-100μA, I_E=0
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	-150			V	I_C=-10mA, I_B=0*
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	-5			V	I_E=-100μA, I_C=0
Collector Cut-Off Current	I_{CBO}			-0.1	μA	V_{CB}=-140V
Emitter Cut-Off Current	I_{EBO}			-0.1	μA	V_{EB}=-4V, I_C=0
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$			-0.3	V	I_C=-100mA, I_B=-10mA*
Base-Emitter Saturation Voltage	$V_{BE(sat)}$			-1	V	I_C=-100mA, I_B=-10mA*
Base-Emitter Turn-on Voltage	$V_{BE(on)}$			-1	V	I_C=-100mA, V_{CE}=-10V*
Static Forward Current Transfer Ratio	h_{FE}	50 50		 300		I_C=-10mA, V_{CE}=-10V* I_C=-300mA, V_{CE}=-10V*
Transition Frequency	f_T	100			MHz	I_C=-50mA, V_{CE}=-10V* f=100MHz
Output Capacitance	C_{obo}			10	pF	V_{CE}=-10V, f=1MHz

*Measured under pulsed conditions. Pulse width=300μs. Duty cycle ≤ 2%

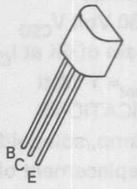
PNP SILICON PLANAR MEDIUM POWER TRANSISTOR

FXT557

ISSUE 1 – MARCH 94

FEATURES

- 300 Volt V_{CEO}
- 0.5 Amp continuous current
- P_{tot}= 1 Watt



E-Line
TO92 Compatible

REFER TO ZTX557 FOR GRAPHS

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	-300	V
Collector-Emitter Voltage	V_{CEO}	-300	V
Emitter-Base Voltage	V_{EBO}	-5	V
Peak Pulse Current	I_{CM}	-1	A
Continuous Collector Current	I_C	-0.5	A
Power Dissipation at T_{amb}=25°C	P_{tot}	1	W
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +200	°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C)

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	-300			V	I_C=-100μA, I_E=0
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	-300			V	I_C=-10mA, I_B=0*
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	-5			V	I_E=-100μA, I_C=0
Collector Cut-Off Current	I_{CBO}			-0.1	μA	V_{CB}=-200V, I_E=0
Emitter Cut-Off Current	I_{EBO}			-0.1	μA	V_{EB}=-4V, I_C=0
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$			-0.3	V	I_C=-50mA, I_B=-5mA*
Base-Emitter Saturation Voltage	$V_{BE(sat)}$			-1	V	I_C=-50mA, I_B=-5mA*
Base-Emitter Turn-on Voltage	$V_{BE(on)}$			-1	V	I_C=-50mA, V_{CE}=-10V*
Static Forward Current Transfer Ratio	h_{FE}	50 50		 300		I_C=-10mA, V_{CE}=-10V* I_C=-50mA, V_{CE}=-10V*
Transition Frequency	f_T	75			MHz	I_C=-50mA, V_{CE}=-10V f=100MHz
Output Capacitance	C_{obo}			10	pF	V_{CE}=-10V, f=1MHz

*Measured under pulsed conditions. Pulse width=300μs. Duty cycle ≤ 2%

NPN SILICON PLANAR MEDIUM POWER DARLINGTON TRANSISTOR

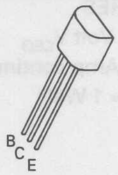
FXT601B

ISSUE 1 – MARCH 94

FEATURES
- 160 Volt V_{CEO}
- Gain of 5K at I_C=1 Amp
- P_{tot}= 1 Watt

APPLICATIONS
- Lamp, solenoid and relay drivers
- Replacement of TO126 and TO220 packages

REFER TO ZTX601B FOR GRAPHS



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	180	V
Collector-Emitter Voltage	V_{CEO}	160	V
Emitter-Base Voltage	V_{EBO}	10	V
Peak Pulse Current	I_{CM}	4	A
Continuous Collector Current	I_C	1	A
Power Dissipation at T_{amb}=25°C	P_{tot}	1	W
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +200	°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

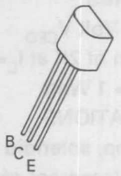
PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	180			V	I_C=100μA, I_E=0
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	160			V	I_C=10mA, I_B=0*
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	10			V	I_E=100μA, I_C=0
Collector Cut-Off Current	I_{CBO}			0.01 10	μA μA	V_{CB}=160V V_{CB}=160V,T_{amb}=100°C
Emitter Cut-Off Current	I_{EBO}			0.1	μA	V_{EB}=8V, I_C=0
Colllector-Emitter Cut-Off Current	I_{CES}			10	μA	V_{CES}=160V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$		0.75 0.85	1.1 1.2	V V	I_C=0.5A, I_B=5mA* I_C=1A, I_B=10mA*
Base-Emitter Saturation Voltage	$V_{BE(sat)}$		1.7	1.9	V	I_C=1A, I_B=10mA*
Base-Emitter Turn-On Voltage	$V_{BE(on)}$		1.5	1.7	V	I_C=1A, V_{CE}=5V*
Static Forward Current Transfer Ratio	h_{FE}	5K 10K 5K	10K 20K 10K	 100K 		I_C=50mA, V_{CE}=10V* I_C=0.5A, V_{CE}=10V* I_C=1A, V_{CE}=10V*
Transition Frequency	f_T	150	250		MHz	I_C=100mA, V_{CE}=10V f=20MHz

*Measured under pulsed conditions. Pulse width=300μs. Duty cycle ≤ 2%

NPN SILICON PLANAR MEDIUM POWER DARLINGTON TRANSISTOR

FXT603

ISSUE 1 – MARCH 94



E-Line
TO92 Compatible

FEATURES

- 80 Volt V_{CEO}
- Gain of 2K at I_C=1 Amp
- P_{tot}= 1 Watt

APPLICATIONS

- Lamp, solenoid and relay drivers
- Replacement of TO126 and TO220 packages

REFER TO ZTX603 FOR GRAPHS

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	100	V
Collector-Emitter Voltage	V_{CEO}	80	V
Emitter-Base Voltage	V_{EBO}	10	V
Peak Pulse Current	I_{CM}	4	A
Continuous Collector Current	I_C	1	A
Power Dissipation at T_{amb}=25°C	P_{tot}	1	W
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +200	°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	100			V	I_C=100μA, I_E=0
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	80			V	I_C=10mA, I_B=0*
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	10			V	I_E=100μA, I_C=0
Collector Cut-Off Current	I_{CBO}			0.01 10	μA μA	V_{CB}=80V, I_E=0 V_{CB}=80V,T_{amb}=100°C
Emitter Cut-Off Current	I_{EBO}			0.1	μA	V_{EB}=8V, I_C=0
Colllector-Emitter Cut-Off Current	I_{CES}			10	μA	V_{CES}=80V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$			1.0 1.0	V V	I_C=0.4A, I_B=0.4mA* I_C=1A, I_B=1mA*
Base-Emitter Saturation Voltage	$V_{BE(sat)}$			1.8	V	I_C=1A, I_B=1mA*
Base-Emitter Turn-On Voltage	$V_{BE(on)}$			1.7	V	I_C=1A, V_{CE}=5V*
Static Forward Current Transfer Ratio	h_{FE}	2000 5000 2000 500		 100K 		I_C=50mA, V_{CE}=5V I_C=500mA, V_{CE}=5V* I_C=1A, V_{CE}=5V* I_C=2A, V_{CE}=5V*
Transition Frequency	f_T	150			MHz	I_C=100mA, V_{CE}=10V f=20MHz

*Measured under pulsed conditions. Pulse width=300μs. Duty cycle ≤ 2%

NPN SILICON PLANAR MEDIUM POWER DARLINGTON TRANSISTOR

FXT605

ISSUE 1 – SEPT 93

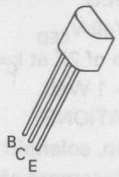
FEATURES

- 120 Volt V_{CEO}
- Gain of 2K at I_C=1 Amp
- P_{tot}= 1 Watt

APPLICATIONS

- Lamp, solenoid and relay drivers
- Replacement of TO126 and TO220 packages

REFER TO ZTX605 FOR GRAPHS



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	140	V
Collector-Emitter Voltage	V_{CEO}	120	V
Emitter-Base Voltage	V_{EBO}	10	V
Peak Pulse Current	I_{CM}	4	A
Continuous Collector Current	I_C	1	A
Power Dissipation at T_{amb} = 25°C	P_{tot}	1	W
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +200	°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	140			V	I_C=100μA, I_E=0
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	120			V	I_C=10mA, $_B$=0*
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	10			V	I_E=100μA, I_C=0
Collector Cut-Off Current	I_{CBO}			0.01 10	μA μA	V_{CB}=120V, I_E=0 V_{CB}=120V,T_{amb}=100°C
Emitter Cut-Off Current	I_{EBO}			0.1	μA	V_{EB}=8V, I_C=0
Colllector-Emitter Cut-Off Current	I_{CES}			10	μA	V_{CES}=120V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$			1.0 1.5	V V	I_C=0.25A, I_B=0.25mA* I_C=1A, I_B=1mA*
Base-Emitter Saturation Voltage	$V_{BE(sat)}$			1.8	V	I_C=1A, I_B=1mA*
Base-Emitter Turn-On Voltage	$V_{BE(on)}$			1.7	V	I_C=1A, V_{CE}=5V*
Static Forward Current Transfer Ratio	h_{FE}	2000 5000 2000 500		 100K 		I_C=50mA, V_{CE}=5V* I_C=500mA, V_{CE}=5V* I_C=1A, V_{CE}=5V* I_C=2A, V_{CE}=5V*
Transition Frequency	f_T	150			MHz	I_C=100mA, V_{CE}=10V f=20MHz

* Measured under pulse conditions. Pulse width=300μs. Duty cycle ≤2%

NPN SILICON PLANAR MEDIUM POWER DARLINGTON TRANSISTOR

FXT614

ISSUE 1 – FEB 94

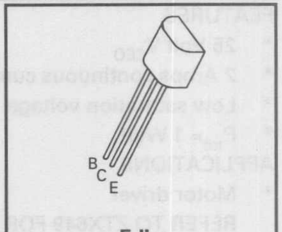
FEATURES

- 100 Volt V_{CEO}
- 800 mA continuous current
- Gain of 10K at I_C=500mA
- P_{tot}= 1 Watt

APPLICATIONS

- Lamp, solenoid and relay drivers

REFER TO BCX38 FOR GRAPHS



E-line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	120	V
Collector-Emitter Voltage	V_{CEO}	100	V
Emitter-Base Voltage	V_{EBO}	10	V
Continuous Collector Current	I_C	800	mA
Power Dissipation at T_{amb}=25°C	P_{tot}	1	W
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +200	°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C).

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	120			V	I_C=10μA, I_E=0
Collector-Emitter Sustaining Voltage	$V_{CEO(SUS)}$	100			V	I_C=10mA, I_B=0*
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	10			V	I_E=10μA, I_C=0
Collector Cut-Off Current	I_{CBO}			100	nA	V_{CB}=60V, I_E=0
Emitter Cut-Off Current	I_{EBO}			100	nA	V_{EB}=8V, I_C=0
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$			1.25	V	I_C=800mA, I_B=8mA*
Base-Emitter Turn-On Voltage	$V_{BE(on)}$			1.8	V	I_C=800mA, V_{CE}=5V*
Static Forward Current Transfer Ratio	h_{FE}	5000 10000				I_C=100mA, V_{CE}=5V* I_C=500mA, V_{CE}=5V*

*Measured under pulsed conditions. Pulse Width=300μs. Duty cycle ≤2%

NPN SILICON PLANAR MEDIUM POWER TRANSISTOR

FXT649

ISSUE 1 – FEB 94

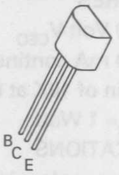
FEATURES

- 25 Volt V_{CEO}
- 2 Amps continuous current
- Low saturation voltage
- P_{tot}= 1 Watt

APPLICATIONS

- Motor driver

REFER TO ZTX649 FOR GRAPHS



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	35	V
Collector-Emitter Voltage	V_{CEO}	25	V
Emitter-Base Voltage	V_{EBO}	5	V
Peak Pulse Current	I_{CM}	6	A
Continuous Collector Current	I_C	2	A
Power Dissipation at T_{amb}=25°C	P_{tot}	1	W
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +200	°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	35			V	I_C=100µA, I_E=0
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	25			V	I_C=10mA, I_B=0*
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	5			V	I_E=100µA, I_C=0
Collector Cut-Off Current	I_{CBO}			0.1	µA	V_{CB}=30V, I_E=0
				10	µA	V_{CB}=30V, T_{amb}=100°C
Emitter Cut-Off Current	I_{EBO}			0.1	µA	V_{EB}=4V, I_C=0
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$		0.12	0.3	V	I_C=1A, I_B=100mA*
			0.23	0.5	V	I_C=2A, I_B=200mA*
Base-Emitter Saturation Voltage	$V_{BE(sat)}$		0.9	1.25	V	I_C=1A, I_B=100mA*
Base-Emitter Turn-On Voltage	$V_{BE(on)}$		0.8	1	V	I_C=1A, V_{CE}=2V*
Static Forward Current Transfer Ratio	h_{FE}	70	200			I_C=50mA, V_{CE}=2V*
		100	200	300		I_C=1A, V_{CE}=2V*
		75	150			I_C=2A, V_{CE}=2V*
		15	50			I_C=6A, V_{CE}=2V*
Transition Frequency	f_T	150			MHz	I_C=100mA, V_{CE}=5V f=100MHz
Output Capacitance	C_{obo}			50	pF	V_{CB}=10V, f=1MHz

*Measured under pulsed conditions. Pulse Width=300µs. Duty cycle ≤2%

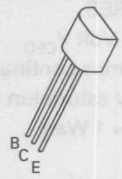
NPN SILICON PLANAR
MEDIUM POWER TRANSISTOR

FXT651

ISSUE 1 – MARCH 94

FEATURES

- 60 Volt V_{CEO}
- 2 Amps continuous current
- Low saturation voltage
- P_{tot}= 1 Watt



E-Line
TO92 Compatible

REFER TO ZTX651 FOR GRAPHS

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	80	V
Collector-Emitter Voltage	V_{CEO}	60	V
Emitter-Base Voltage	V_{EBO}	5	V
Peak Pulse Current	I_{CM}	6	A
Continuous Collector Current	I_C	2	A
Power Dissipation at T_{amb}=25°C	P_{tot}	1	W
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +200	°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	80			V	I_C=100μA, I_E=0
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	60			V	I_C=10mA, I_B=0*
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	5			V	I_E=100μA, I_C=0
Collector Cut-Off Current	I_{CBO}			0.1 10	μA μA	V_{CB}=60V, I_E=0 V_{CB}=60V,T_{amb}=100°C
Emitter Cut-Off Current	I_{EBO}			0.1	μA	V_{EB}=4V, I_C=0
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$		0.12 0.23	0.3 0.5	V V	I_C=1A, I_B=100mA* I_C=2A, I_B=200mA*
Base-Emitter Saturation Voltage	$V_{BE(sat)}$		0.9	1.25	V	I_C=1A, I_B=100mA*
Base-Emitter Turn-On Voltage	$V_{BE(on)}$		0.8	1	V	I_C=1A, V_{CE}=2V*
Static Forward Current Transfer Ratio	h_{FE}	70 100 80 40	200 200 170 80	 300 		I_C=50mA, V_{CE}=2V* I_C=500mA, V_{CE}=2V* I_C=1A, V_{CE}=2V* I_C=2A, V_{CE}=2V*
Transition Frequency	f_T	140	175		MHz	I_C=100mA, V_{CE}=5V f=100MHz
Output Capacitance	C_{obo}			30	pF	V_{CB}=10V, f=1MHz

*Measured under pulsed conditions. Pulse Width=300μs. Duty cycle ≤2%

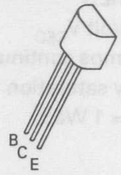
NPN SILICON PLANAR
MEDIUM POWER TRANSISTOR

FXT653

ISSUE 1 – MARCH 94

FEATURES

- 100 Volt V_{CEO}
- 2 Amps continuous current
- Low saturation voltage
- P_{tot}= 1 Watt



E-Line
TO92 Compatible

REFER TO ZTX653 FOR GRAPHS

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	120	V
Collector-Emitter Voltage	V_{CEO}	100	V
Emitter-Base Voltage	V_{EBO}	5	V
Peak Pulse Current	I_{CM}	6	A
Continuous Collector Current	I_C	2	A
Power Dissipation at T_{amb}=25°C	P_{tot}	1	W
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +200	°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	120			V	I_C=100µA, I_E=0
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	100			V	I_C=10mA, I_B=0*
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	5			V	I_E=100µA, I_C=0
Collector Cut-Off Current	I_{CBO}			0.1 10	µA µA	V_{CB}=100V, I_E=0 V_{CB}=100V,T_{amb}=100°C
Emitter Cut-Off Current	I_{EBO}			0.1	µA	V_{EB}=4V, I_C=0
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$		0.13 0.23	0.3 0.5	V V	I_C=1A, I_B=100mA* I_C=2A, I_B=200mA*
Base-Emitter Saturation Voltage	$V_{BE(sat)}$		0.9	1.25	V	I_C=1A, I_B=100mA*
Base-Emitter Turn-On Voltage	$V_{BE(on)}$		0.8	1	V	I_C=1A, V_{CE}=2V*
Static Forward Current Transfer Ratio	h_{FE}	70 100 55 25	200 200 110 55	 300 		I_C=50mA, V_{CE}=2V* I_C=500mA, V_{CE}=2V* I_C=1A, V_{CE}=2V* I_C=2A, V_{CE}=2V*
Transition Frequency	f_T	140	175		MHz	I_C=100mA, V_{CE}=5V f=100MHz
Output Capacitance	C_{obo}			30	pF	V_{CB}=10V, f=1MHz

*Measured under pulsed conditions. Pulse Width=300µs. Duty cycle ≤2%

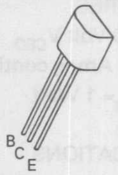
NPN SILICON PLANAR
MEDIUM POWER TRANSISTOR

FXT655

ISSUE 1 – FEB 94

FEATURES

- 150 Volt V_{CEO}
- 1 Amp continuous current
- Low saturation voltage
- P_{tot}= 1 Watt



E-Line
TO92 Compatible

REFER TO ZTX655 FOR GRAPHS

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	150	V
Collector-Emitter Voltage	V_{CEO}	150	V
Emitter-Base Voltage	V_{EBO}	5	V
Peak Pulse Current	I_{CM}	2	A
Continuous Collector Current	I_C	1	A
Power Dissipationat T_{amb}=25°C	P_{tot}	1	W
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +200	°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C).

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	150			V	I_C=100μA, I_E=0
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	150			V	I_C=10mA, I_B=0*
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	5			V	I_E=100μA, I_C=0
Collector Cut-Off Current	I_{CBO}			100	nA	V_{CB}=125V, I_E=0
Emitter Cut-Off Current	I_{EBO}			100	nA	V_{EB}=3V, I_C=0
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$			0.5 0.5	V V	I_C=500mA, I_B=50mA* I_C=1A, I_B=200mA*
Base-Emitter Saturation Voltage	$V_{BE(sat)}$			1.1	V	I_C=500mA, I_B=50mA*
Base-Emitter Turn-On Voltage	$V_{BE(on)}$			1	V	I_C=500mA, V_{CE}=5V*
Static Forward Current Transfer Ratio	h_{FE}	50 50 20				I_C=10mA, V_{CE}=5V I_C=500mA, V_{CE}=5V* I_C=1A, V_{CE}=5V*
Transition Frequency	f_T	30			MHz	I_C=10mA, V_{CE}=20V f=20MHz
Output Capacitance	C_{obo}			20	pF	V_{CB}=20V, f=1MHz

*Measured under pulsed conditions. Pulse Width=300μs. Duty cycle ≤2%

NPN SILICON PLANAR MEDIUM POWER TRANSISTOR

FXT657

ISSUE 1 – FEB 94

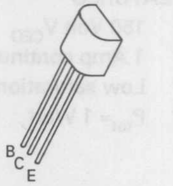
FEATURES

* 300 Volt V_{CEO}
* 0.5 Amps continuous current
* P_{tot}= 1 Watt

APPLICATIONS

* Telephone dialler circuits
* Video output drivers

REFER TO ZTX657 FOR GRAPHS



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	300	V
Collector-Emitter Voltage	V_{CEO}	300	V
Emitter-Base Voltage	V_{EBO}	5	V
Peak Pulse Current	I_{CM}	1	A
Continuous Collector Current	I_C	0.5	A
Power Dissipation at T_{amb}=25°C	P_{tot}	1	W
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +200	°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C).

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	300			V	I_C=100µA, I_E=0
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	300			V	I_C=10mA, , I_B=0*
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	5			V	I_E=100µA, I_C=0
Collector Cut-Off Current	I_{CBO}			100	nA	V_{CB}=200V, I_E=0
Emitter Cut-Off Current	I_{EBO}			100	nA	V_{EB}=3V, I_C=0
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$			0.5	V	I_C=100mA, I_B=10mA*
Base-Emitter Saturation Voltage	$V_{BE(sat)}$			1	V	I_C=100mA, I_B=10mA*
Base-Emitter Turn-On Voltage	$V_{BE(on)}$			1	V	I_C=100mA, V_{CE}=5V*
Static Forward Current Transfer Ratio	h_{FE}	40 50				I_C=10mA, V_{CE}=5V* I_C=100mA, V_{CE}=5V*
Transition Frequency	f_T	30			MHz	I_C=10mA, V_{CE}=20V f=20MHz
Output Capacitance	C_{obo}			20	pF	V_{CB}=20V, f=1MHz

* Measured under pulsed conditions. Pulse width=300µs. Duty cycle ≤2%

NPN SILICON PLANAR MEDIUM POWER HIGH GAIN TRANSISTOR

FXT688B

ISSUE 1 – MARCH 94

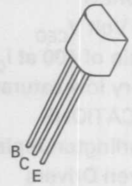
FEATURES

- 12 Volt V_{CEO}
- Gain of 400 at I_C=3 Amps
- P_{tot}= 1 Watt

APPLICATIONS

- Darlington replacement
- Battery powered circuits
- Motor drivers

REFER TO ZTX688B FOR GRAPHS



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	12	V
Collector-Emitter Voltage	V_{CEO}	12	V
Emitter-Base Voltage	V_{EBO}	5	V
Peak Pulse Current	I_{CM}	10	A
Continuous Collector Current	I_C	3	A
Power Dissipation at T_{amb}=25°C	P_{tot}	1	W
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +200	°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C).

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	12			V	I_C=100µA, I_E=0
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	12			V	I_C=10mA, I_B=0*
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	5			V	I_E=100µA, I_C=0
Collector Cut-Off Current	I_{CBO}			0.1	µA	V_{CB}=10V, I_E=0
Emitter Cut-Off Current	I_{EBO}			0.1	µA	V_{EB}=4V, I_C=0
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$			0.04 0.06 0.18 0.35	V V V V	I_C=0.1A, I_B=1mA I_C=0.1A, I_B=0.5mA* I_C=1A, I_B=50mA* I_C=3A, I_B=20mA*
Base-Emitter Saturation Voltage	$V_{BE(sat)}$			1.1	V	I_C=3A, I_B=20mA*
Base-Emitter Turn-On Voltage	$V_{BE(on)}$			1	V	I_C=3A, V_{CE}=2V*
Static Forward Current Transfer Ratio	h_{FE}	500 400 100				I_C=0.1A, V_{CE}=2V I_C=3A, V_{CE}=2V* I_C=10A, V_{CE}=2V*
Transition Frequency	f_T	150			MHz	I_C=50mA, V_{CE}=5V f=50MHz
Output Capacitance	C_{obo}		40		pF	V_{CE}=10V, f=1MHz

*Measured under pulsed conditions. Pulse width=300µs. Duty cycle ≤2%

NPN SILICON PLANAR MEDIUM POWER HIGH GAIN TRANSISTOR

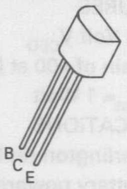
FXT690B

ISSUE 1 – MAY 94

FEATURES
- 45 Volt V_{CEO}
- Gain of 400 at I_C=1 Amp
- Very low saturation voltage

APPLICATIONS
- Darlington replacement
- Siren Drivers
- Battery powered circuits
- Motor drivers

REFER TO ZTX690B FOR GRAPHS



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	45	V
Collector-Emitter Voltage	V_{CEO}	45	V
Emitter-Base Voltage	V_{EBO}	5	V
Peak Pulse Current	I_{CM}	6	A
Continuous Collector Current	I_C	2	A
Practical Power Dissipation*	P_{totp}	1.5	W
Power Dissipation at T_{amb}=25°C derate above 25°C	P_{tot}	1 5.7	W mW/°C
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +200	°C

*The power which can be dissipated assuming the device is mounted in a typical manner on a P.C.B. with copper equal to 1 inch square minimum

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C)

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	45			V	I_C=100μA
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	45			V	I_C=10mA*
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	5			V	I_E=100μA
Collector Cut-Off Current	I_{CBO}			0.1	μA	V_{CB}=35V
Emitter Cut-Off Current	I_{EBO}			0.1	μA	V_{EB}=4V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$			0.1 0.5	V V	I_C=0.1A, I_B=0.5mA* I_C=1A, I_B=5mA*
Base-Emitter Saturation Voltage	$V_{BE(sat)}$			0.9	V	I_C=1A, I_B=10mA*
Base-Emitter Turn-On Voltage	$V_{BE(on)}$			0.9	V	I_C=1A, V_{CE}=2V*
Static Forward Current Transfer Ratio	h_{FE}	500 400 150				I_C=100mA, V_{CE}=2V* I_C=1A, V_{CE}=2V* I_C=2A, V_{CE}=2V*

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C)

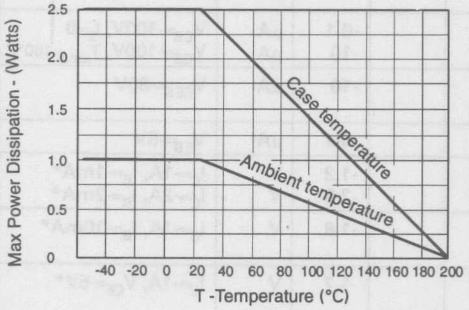
PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Transition Frequency	f_T	150			MHz	I_C=50mA, V_{CE}=5V f=50MHz
Input Capacitance	C_{ibo}		200		pF	V_{EB}=0.5V, f=1MHz
Output Capacitance	C_{obo}		16		pF	V_{CB}=10V, f=1MHz
Switching Times	t_{on} t_{off}		33 1300		ns ns	I_C=500mA, I_{B1}=50mA I_{B2}=50mA, V_{CC}=10V

*Measured under pulsed conditions. Pulse width=300µs. Duty cycle ≤2%

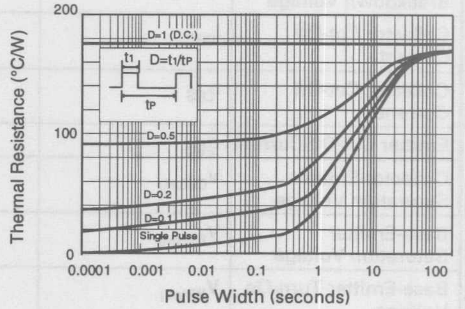
THERMAL CHARACTERISTICS

PARAMETER	SYMBOL	MAX.	UNIT
Thermal Resistance:Junction to Ambient$_1$ Junction to Ambient$_2$ Junction to Case	$R_{th(j-amb)1}$ $R_{th(j-amb)2}$† $R_{th(j-case)}$	175 116 70	°C/W °C/W °C/W

† Device mounted on P.C.B. with copper equal to 1 sq. Inch minimum.



Derating curve



Maximum transient thermal impedance

PNP SILICON PLANAR MEDIUM POWER DARLINGTON TRANSISTOR

FXT704

ISSUE 1 – FEB 94

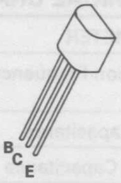
FEATURES

- * 100 Volt V_{CEO}
- * Gain of 3K at I_C=1 Amp
- * P_{tot}= 1 Watt

APPLICATIONS

- * Lamp, solenoid and relay drivers
- * Replacement of TO126 and TO220 darlington transistors

REFER TO ZTX704 FOR GRAPHS



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	-120	V
Collector-Emitter Voltage	V_{CEO}	-100	V
Emitter-Base Voltage	V_{EBO}	-10	V
Peak Pulse Current	I_{CM}	-4	A
Continuous Collector Current	I_C	-1	A
Power Dissipation at T_{amb}=25°C	P_{tot}	1	W
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +200	°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	-120			V	I_C=-100µA, I_E=0
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	-100			V	I_C=-10mA, I_B=0*
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	-10			V	I_E=-100µA, I_C=0
Collector Cut-Off Current	I_{CBO}			-0.1	µA	V_{CB}=-100V, I_E=0
				-10	µA	V_{CB}=-100V, T_{amb}=100°C
Collector Cut-Off Current	I_{CES}			-10	µA	V_{CES}=-80V
Emitter Cut-Off Current	I_{EBO}			-0.1	µA	V_{EB}=-8V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$			-1.3	V	I_C=-1A, I_B=-1mA*
				-2.5	V	I_C=-2A, I_B=-2mA*
Base-Emitter Saturation Voltage	$V_{BE(sat)}$			-1.8	V	I_C=-1A, I_B=-10mA*
Base-Emitter Turn-On Voltage	$V_{BE(on)}$			-1.7	V	I_C=-1A, V_{CE}=-5V*
Static Forward Current Transfer Ratio	h_{FE}	3k				I_C=-10mA, V_{CE}=-5V*
		3k				I_C=-100mA, V_{CE}=-5V*
		3k		30k		I_C=-1A, V_{CE}=-5V*
		2k				I_C=-2A, V_{CE}=-5V*
Transition Frequency	f_T		160		MHz	I_C=-100mA, V_{CE}=-10V f=20MHz

*Measured under pulsed conditions. Pulse width=300µs. Duty cycle ≤ 2%

PNP SILICON PLANAR MEDIUM POWER DARLINGTON TRANSISTOR

FXT705

ISSUE 1 – FEB 94

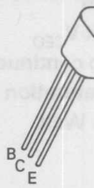
FEATURES

- 120 Volt V_{CEO}
- Gain of 3K at I_C=1 Amp
- P_{tot}= 1 Watt

APPLICATIONS

- Lamp, solenoid and relay drivers
- Replacement of TO126 and TO220 darlingtons

REFER TO ZTX705 FOR GRAPHS



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	-140	V
Collector-Emitter Voltage	V_{CEO}	-120	V
Emitter-Base Voltage	V_{EBO}	-10	V
Peak Pulse Current	I_{CM}	-4	A
Continuous Collector Current	I_C	-1	A
Power Dissipation at T_{amb}=25°C	P_{tot}	1	W
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +200	°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	-140			V	I_C=-100μA, I_E=0
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	-120			V	I_C=-10mA, I_B=0*
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	-10			V	I_E=-100μA, I_C=0
Collector Cut-Off Current	I_{CBO}			-0.1 -10	μA μA	V_{CB}=-120V, I_E=0 V_{CB}=-120V, T_{amb}=100°C
Collector Cut-Off Current	I_{CES}			-10	μA	V_{CES}=-80V
Emitter Cut-Off Current	I_{EBO}			-0.1	μA	V_{EB}=-8V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$			-1.3 -2.5	V V	I_C=-1A, I_B=-1mA* I_C=-2A, I_B=-2mA*
Base-Emitter Saturation Voltage	$V_{BE(sat)}$			-1.8	V	I_C=-1A, I_B=-10mA*
Base-Emitter Turn-On Voltage	$V_{BE(on)}$			-1.7	V	I_C=-1A, V_{CE}=-5V*
Static Forward Current Transfer Ratio	h_{FE}	3k 3k 3k 2k		 30k 		I_C=-10mA, V_{CE}=-5V* I_C=-100mA, V_{CE}=-5V* I_C=-1A, V_{CE}=-5V* I_C=-2A, V_{CE}=-5V*
Transition Frequency	f_T		160		MHz	I_C=-100mA, V_{CE}=-10V f=20MHz

*Measured under pulsed conditions. Pulse width=300μs. Duty cycle ≤ 2%

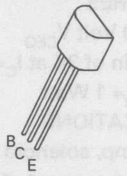
PNP SILICON PLANAR MEDIUM POWER TRANSISTOR

FXT749

ISSUE 1 – FEB 94

FEATURES

- 25 Volt V_{CEO}
- 2 Amp continuous current
- Low saturation voltage
- P_{tot}= 1 Watt



E-Line
TO92 Compatible

REFER TO ZTX749 FOR GRAPHS

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	-35	V
Collector-Emitter Voltage	V_{CEO}	-25	V
Emitter-Base Voltage	V_{EBO}	-5	V
Peak Pulse Current	I_{CM}	-6	A
Continuous Collector Current	I_C	-2	A
Power Dissipation at T_{amb}=25°C	P_{tot}	1	W
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +200	°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	-35			V	I_C=-100μA, I_E=0
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	-25			V	I_C=-10mA, I_B=0*
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	-5			V	I_E=-100μA, I_C=0
Collector Cut-Off Current	I_{CBO}			-0.1 -10	μA μA	V_{CB}=-30V V_{CB}=-30V,T_{amb}=100°C
Emitter Cut-Off Current	I_{EBO}			-0.1	μA	V_{EB}=-4V, I_E=0
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$		-0.12 -0.23	-0.3 -0.5	V V	I_C=-1A, I_B=-100mA* I_C=-2A, I_B=-200mA*
Base-Emitter Saturation Voltage	$V_{BE(sat)}$		-0.9	-1.25	V	I_C=-1A, I_B=-100mA*
Base-Emitter Turn-On Voltage	$V_{BE(on)}$		-0.8	-1	V	I_C=-1A, V_{CE}=-2V*
Static Forward Current Transfer Ratio	h_{FE}	70 100 75 15	200 200 150 50	 300		I_C=-50mA, V_{CE}=-2V* I_C=-1A, V_{CE}=-2V* I_C=-2A, V_{CE}=-2V* I_C=-6A, V_{CE}=-2V*
Transition Frequency	f_T	100	160		MHz	I_C=-100mA, V_{CE}=-5V f=100MHz
Output Capacitance	C_{obo}			100	pF	V_{CB}=-10V, f=1MHz

*Measured under pulsed conditions. Pulse width=300μs. Duty cycle ≤2%

PNP SILICON PLANAR
MEDIUM POWER TRANSISTOR

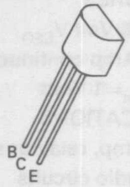
FXT751

ISSUE 1 – FEB 94

FEATURES
- 60 Volt V_{CEO}
- 2 Amp continuous current
- P_{tot}= 1 Watt

APPLICATIONS
- Lamp, relay or solenoid drivers
- Audio circuits
- Replacement of TO126 and TO220 parts

REFER TO ZTX751 FOR GRAPHS



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	-80	V
Collector-Emitter Voltage	V_{CEO}	-60	V
Emitter-Base Voltage	V_{EBO}	-5	V
Peak Pulse Current	I_{CM}	-6	A
Continuous Collector Current	I_C	-2	A
Power Dissipation at T_{amb}=25°C	P_{tot}	1	W
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +200	°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	-80			V	I_C=-100μA, I_E=0
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	-60			V	IC=-10mA, I_B=0*
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	-5			V	I_E=-100μA, I_C=0
Collector Cut-Off Current	I_{CBO}			-0.1 -10	μA μA	V_{CB}=-60V, I_E=0 V_{CB}=-60V, T_{amb}=100°C
Emitter Cut-Off Current	I_{EBO}			-0.1	μA	V_{EB}=-4V, I_C=0
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$		-0.15 -0.28	-0.3 -0.5	V V	I_C=-1A, I_B=-100mA* I_C=-2A, I_B=-200mA*
Base-Emitter Saturation Voltage	$V_{BE(sat)}$		-0.90	-1.25	V	I_C=-1A, I_B=-100mA*
Base-Emitter Turn-On Voltage	$V_{BE(on)}$		-0.8	-1.0	V	I_C=-1A, V_{CE}=-2V*
Static Forward Current Transfer Ratio	h_{FE}	70 100 80 40	200 200 170 150	 300 		I_C=-50mA, V_{CE}=-2V* I_C=-500mA, V_{CE}=-2V* I_C=-1A, V_{CE}=-2V* I_C=-2A, V_{CE}=-2V*
Transition Frequency	f_T	100	140		MHz	I_C=-100mA, V_{CE}=-5V f=100MHz
Output Capacitance	C_{obo}			30	pF	V_{CB}=-10V, f=1MHz

*Measured under pulsed conditions. Pulse width=300μs. Duty cycle ≤2%

PNP SILICON PLANAR MEDIUM POWER TRANSISTOR

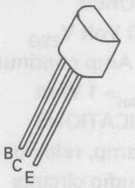
FXT753

ISSUE 1 – FEB 94

FEATURES
- 100 Volt V_{CEO}
- 2 Amp continuous current
- P_{tot} = 1 Watt

APPLICATIONS
- Lamp, relay or solenoid drivers
- Audio circuits
- Replacement of TO126 and TO220 devices

REFER TO ZTX753 FOR GRAPHS



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	-120	V
Collector-Emitter Voltage	V_{CEO}	-100	V
Emitter-Base Voltage	V_{EBO}	-5	V
Peak Pulse Current	I_{CM}	-6	A
Continuous Collector Current	I_C	-2	A
Power Dissipation at T_{amb}=25°C	P_{tot}	1	W
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +200	°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	-120			V	I_C=-100μA, I_E=0
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	-100			V	I_C=-10mA, I_B=0*
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	-5			V	I_E=-100μA, I_C=0
Collector Cut-Off Current	I_{CBO}			-0.1 -10	μA μA	V_{CB}=-100V, I_E=0 V_{CB}=-100V, T_{amb}=100°C
Emitter Cut-Off Current	I_{EBO}			-0.1	μA	V_{EB}=-4V, I_C=0
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$		-0.17 -0.30	-0.3 -0.5	V V	I_C=-1A, I_B=-100mA* I_C=-2A, I_B=-200mA*
Base-Emitter Saturation Voltage	$V_{BE(sat)}$		-0.90	-1.25	V	I_C=-1A, I_B=-100mA*
Base-Emitter Turn-On Voltage	$V_{BE(on)}$		-0.8	-1.0	V	I_C=-1A, V_{CE}=-2V*
Static Forward Current Transfer Ratio	h_{FE}	70 100 55 25	200 200 170 55	 300 		I_C=-50mA, V_{CE}=-2V* I_C=-500mA, V_{CE}=-2V* I_C=-1A, V_{CE}=-2V* I_C=-2A, V_{CE}=-2V*
Transition Frequency	f_T	100	140		MHz	I_C=-100mA, V_{CE}=-5V f=100MHz
Output Capacitance	C_{obo}			30	pF	V_{CB}=-10V, f=1MHz

*Measured under pulsed conditions. Pulse width=300μs. Duty cycle ≤2%

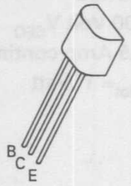
PNP SILICON PLANAR MEDIUM POWER TRANSISTOR

FXT755

ISSUE 1 – FEB 94

FEATURES

- 150 Volt V_{CEO}
- 1 Amp continuous current
- Low saturation voltage
- P_{tot}= 1 Watt



E-Line
TO92 Compatible

REFER TO ZTX755 FOR GRAPHS

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	-150	V
Collector-Emitter Voltage	V_{CEO}	-150	V
Emitter-Base Voltage	V_{EBO}	-5	V
Peak Pulse Current	I_{CM}	-2	A
Continuous Collector Current	I_C	-1	A
Power Dissipation at T_{amb}=25°C	P_{tot}	1	W
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +200	°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C).

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	-150			V	I_C=-100μA, I_E=0
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	-150			V	I_C=-10mA, I_B=0*
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	-5			V	I_E=-100μA, I_C=0
Collector Cut-Off Current	I_{CBO}			-100	nA	V_{CB}=-125V, I_E=0
Emitter Cut-Off Current	I_{EBO}			-100	nA	V_{EB}=-3V, I_C=0
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$			-0.5 -0.5	V V	I_C=-500mA, I_B=-50mA* I_C=-1A, I_B=-200mA*
Base-Emitter Saturation Voltage	$V_{BE(sat)}$			-1.1	V	I_C=-500mA, I_B=-50mA*
Base-Emitter Turn-On Voltage	$V_{BE(on)}$			-1.0	V	I_C=-500mA, V_{CE}=-5V*
Static Forward Current Transfer Ratio	h_{FE}	50 50 20				I_C=-10mA, V_{CE}=-5V I_C=-500mA, V_{CE}=-5V* I_C=-1A, V_{CE}=-5V*
Transition Frequency	f_T	30			MHz	I_C=-10mA, V_{CE}=-20V f=20MHz
Output Capacitance	C_{obo}			20	pF	V_{CB}=-20V, f=1MHz

*Measured under pulsed conditions. Pulse width=300μs. Duty cycle ≤2%

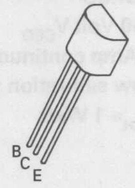
PNP SILICON PLANAR MEDIUM POWER HIGH VOLTAGE TRANSISTOR

FXT757

ISSUE 1 – FEB 94

FEATURES

- 300 Volt V_{CEO}
- 0.5 Amp continuous current
- P_{tot}= 1 Watt



E-Line
TO92 Compatible

REFER TO ZTX757 FOR GRAPHS

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	-300	V
Collector-Emitter Voltage	V_{CEO}	-300	V
Emitter-Base Voltage	V_{EBO}	-5	V
Peak Pulse Current	I_{CM}	-1	A
Continuous Collector Current	I_C	-0.5	A
Power Dissipation at T_{amb} = 25°C	P_{tot}	1	W
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +200	°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C).

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	-300			V	I_C=-100μA, I_E=0
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	-300			V	I_C=-10mA, I_B=0*
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	-5			V	I_E=-100μA, I_C=0
Collector Cut-Off Current	I_{CBO}			-100	nA	V_{CB}=-200V, I_E=0
Emitter Cut-Off Current	I_{EBO}			-100	nA	V_{EB}=-3V, I_C=0
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$			-0.5	V	I_C=-100mA, I_B=-10mA*
Base-Emitter Saturation Voltage	$V_{BE(sat)}$			-1.0	V	I_C=-100mA, I_B=-10mA*
Base-Emitter Turn-On Voltage	$V_{BE(on)}$			-1.0	V	I_C=-100mA, V_{CE}=-5V*
Static Forward Current Transfer Ratio	h_{FE}	40 50				I_C=-10mA, V_{CE}=-5V* I_C=-100mA, V_{CE}=-5V*
Transition Frequency	f_T	30			MHz	I_C=-10mA, V_{CE}=-20V f=20MHz
Output Capacitance	C_{obo}			20	pF	V_{CB}=-20V, f=1MHz

*Measured under pulsed conditions. Pulse width=300μs. Duty cycle ≤2%

PNP SILICON PLANAR MEDIUM POWER HIGH GAIN TRANSISTOR

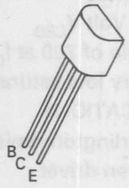
FXT788B

ISSUE 1 – FEB 94

FEATURES
- 15 Volt V_{CEO}
- High gain and low saturation voltage

APPLICATIONS
- Darlington replacement
- Flash gun convertors
- Battery powered circuits
- Motor drivers

REFER TO ZTX788B FOR GRAPHS



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	-15	V
Collector-Emitter Voltage	V_{CEO}	-15	V
Emitter-Base Voltage	V_{EBO}	-5	V
Peak Pulse Current	I_{CM}	-8	A
Continuous Collector Current	I_C	-3	A
Power Dissipation at T_{amb}=25°C	P_{tot}	1	W
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +200	°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	-15			V	I_C=-100μA, I_E=0
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	-15			V	I_C=-10mA, I_B=0*
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	-5			V	I_E=100μA, I_C=0
Collector Cut-Off Current	I_{CBO}			-0.1	μA	V_{CB}=-10V, I_E=0
Emitter Cut-Off Current	I_{EBO}			-0.1	μA	V_{EB}=-4V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$			-0.15 -0.25 -0.45	V V V	I_C=-0.5A, I_B=-2.5mA* I_C=-1A, I_B=-5mA* I_C=-2A, I_B=-10mA*
Base-Emitter Saturation Voltage	$V_{BE(sat)}$			-0.9	V	I_C=-1A, I_B=-5mA*
Base-Emitter Turn-On Voltage	$V_{BE(on)}$		-0.75		V	I_C=-1A, V_{CE}=-2V*
Static Forward Current Transfer Ratio	h_{FE}	500 400 300 150		1500		I_C=-10mA, V_{CE}=-2V* I_C=-1A, V_{CE}=-2V* I_C=-2A, V_{CE}=-2V* I_C=-6A, V_{CE}=-2V*
Transition Frequency	f_T	100			MHz	I_C=-50mA, V_{CE}=-5V f=50MHz

*Measured under pulsed conditions. Pulse width=300μs. Duty cycle ≤2%

PNP SILICON PLANAR MEDIUM POWER HIGH GAIN TRANSISTOR

FXT790A

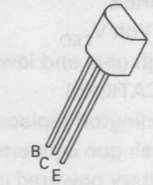
ISSUE 2 – APRIL 94

FEATURES

- * 40 Volt V_{CEO}
- * Gain of 200 at I_C=1 Amps
- * Very low saturation voltage

APPLICATIONS

- * Darlington replacement
- * Siren driver
- * Battery powered circuits
- * Motor drivers



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	-50	V
Collector-Emitter Voltage	V_{CEO}	-40	V
Emitter-Base Voltage	V_{EBO}	-5	V
Peak Pulse Current	I_{CM}	-6	A
Continuous Collector Current	I_C	-2	A
Practical Power Dissipation*	P_{totp}	1.5	W
Power Dissipation at T_{amb}=25°C derate above 25°C	P_{tot}	1 5.7	W mW/°C
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +200	°C

*The power which can be dissipated assuming the device is mounted in a typical manner on a P.C.B. with copper equal to 1 inch square minimum

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C)

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	-50			V	I_C=-100µA
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	-40			V	I_C=-10mA*
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	-5			V	I_E=-100µA
Collector Cut-Off Current	I_{CBO}			-0.1	µA	V_{CB}=-30V
Emitter Cut-Off Current	I_{EBO}			-0.1	µA	V_{EB}=-4V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$			-0.25 -0.45 -0.75	V V V	I_C=-500mA, I_B=-5mA* I_C=-1A, I_B=-10mA* I_C=-2A, I_B=-50mA*
Base-Emitter Saturation Voltage	$V_{BE(sat)}$			-1.0	V	I_C=-1A, I_B=-10mA*
Base-Emitter Turn-On Voltage	$V_{BE(on)}$		-0.75		V	I_C=-1A, V_{CE}=-2V*
Static Forward Current Transfer Ratio	h_{FE}	300 250 200 150		800		I_C=-10mA, V_{CE}=-2V. I_C=-500mA, V_{CE}=-2V* I_C=-1A, V_{CE}=-2V* I_C=-2A, V_{CE}=-2V*

FXT790A

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C)

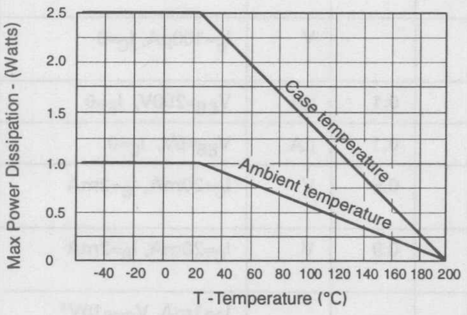
PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Transition Frequency	f_T	100			MHz	I_C=-50mA, V_{CE}=-5V f=50MHz
Input Capacitance	C_{ibo}		225		pF	V_{EB}=-0.5V, f=1MHz
Output Capacitance	C_{obo}		24		pF	V_{CB}=-10V, f=1MHz
Switching Times	t_{on} t_{off}		35 600		ns ns	I_C=-500mA, I_{B1}=-50mA I_{B2}=-50mA, V_{CC}=-10V

*Measured under pulsed conditions. Pulse width=300µs. Duty cycle ≤2%

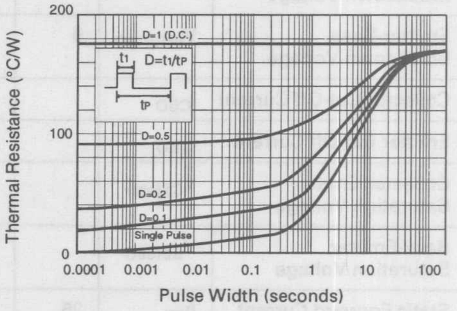
THERMAL CHARACTERISTICS

PARAMETER	SYMBOL	MAX.	UNIT
Thermal Resistance: Junction to Ambient$_1$ Junction to Ambient$_2$ Junction to Case	$R_{th(j-amb)1}$ $R_{th(j-amb)2}$† $R_{th(j-case)}$	175 116 70	°C/W °C/W °C/W

† Device mounted on P.C.B. with copper equal to 1 sq. Inch minimum.



Derating curve



Maximum transient thermal impedance

NPN SILICON PLANAR
HIGH VOLTAGE TRANSISTOR

FXTA42

ISSUE 1 – SEPT 93

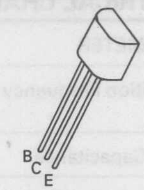
FEATURES

* 300 Volt V_{CEO}

APPLICATIONS

* Telephone dialler circuits

REFER TO MPSA42 FOR GRAPHS



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	300	V
Collector-Emitter Voltage	V_{CEO}	300	V
Emitter-Base Voltage	V_{EBO}	6	V
Continuous Collector Current	I_C	500	mA
Power Dissipation at T_{amb}=25°C	P_{tot}	680	mW
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +175	°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C).

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	300			V	I_C=100μA, I_E=0
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	300			V	I_C=1mA, I_B=0*
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	6			V	I_E=100μA, I_C=0
Collector Cut-Off Current	I_{CBO}			0.1	μA	V_{CB}=200V, I_E=0
Emitter Cut-Off Current	I_{EBO}			0.1	μA	V_{EB}=6V, I_C=0
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$			0.5	V	I_C=20mA, I_B=2mA
Base-Emitter Saturation Voltage	$V_{BE(sat)}$			0.9	V	I_C=20mA, I_B=2mA
Static Forward Current Transfer Ratio	h_{FE}	25 40 40				I_C=1mA, V_{CE}=10V* I_C=10mA, V_{CE}=10V* I_C=30mA, V_{CE}=10V*
Transition Frequency	f_T	50			MHz	I_C=10mA, V_{CE}=20V f=20MHz
Output Capacitance	C_{obo}			6	pF	V_{CB}=20V, f=1MHz

* Measured under pulsed conditions. Pulse width=300μs. Duty cycle ≤ 2%

PNP SILICON PLANAR
HIGH VOLTAGE TRANSISTOR

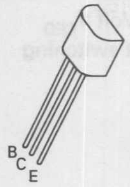
FXTA92

ISSUE 1 – MARCH 94

FEATURES
- * 300 Volt V_{CEO}

APPLICATIONS
- * Telephone dialler circuits

REFER TO MPSA92 FOR GRAPHS



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	-300	V
Collector-Emitter Voltage	V_{CEO}	-300	V
Emitter-Base Voltage	V_{EBO}	-5	V
Continuous Collector Current	I_C	-500	mA
Power Dissipation at T_{amb}=25°C	P_{tot}	680	mW
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +175	°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	-300			V	I_C=-100μA, I_E=0
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	-300			V	I_C=-1mA, I_B=0*
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	-5			V	I_E=-10μA, I_C=0
Collector Cut-Off Current	I_{CBO}			-0.25	μA	V_{CB}=-200V, I_E=0
Emitter Cut-Off Current	I_{EBO}			-0.1	μA	V_{EB}=-3V, I_C=0
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$			-0.5	V	I_C=-20mA, I_B=-2mA
Base-Emitter Saturation Voltage	$V_{BE(sat)}$			-0.9	V	I_C=-20mA, I_B=-2mA
Static Forward Current Transfer Ratio	h_{FE}	25 40 25				I_C=-1mA, V_{CE}=-10V* I_C=-10mA, V_{CE}=-10V* I_C=-30mA, V_{CE}=-10V*
Transition Frequency	f_T	50			MHz	I_C=-10mA, V_{CE}=-20V f=20MHz
Output Capacitance	C_{obo}			6	pF	V_{CB}=-20V, f=1MHz

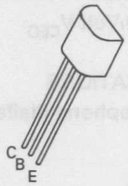
* Measure under pulsed conditions. Pulse Width=300μs. Duty cycle ≤ 2%

NPN SILICON PLANAR SWITCHING TRANSISTOR

ISSUE 2 – APRIL 94

MPS2222A

FEATURES
- 40 Volt V_{CEO}
- Fast switching



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	75	V
Collector-Emitter Voltage	V_{CEO}	40	V
Emitter-Base Voltage	V_{EBO}	6	V
Continuous Collector Current	I_C	800	mA
Power Dissipation at T_{amb}=25°C	P_{tot}	500	mW
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +175	°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

PARAMETER	SYMBOL	MIN.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	75		V	$I_C=10\mu A$, $I_E=0$
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	40		V	$I_C=10mA$, $I_B=0$
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	6		V	$I_E=10\mu A$, $I_C=0$
Collector Cut-Off Current	I_{CBO}		10	nA	$V_{CB}=60V$, $I_E=0$
			10	μA	$V_{CB}=60V$, $I_E=0$, $T_{amb}=150°C$
Emitter Cut-Off Current	I_{EBO}		10	nA	$V_{EB}=3V$, $I_C=0$
Collector-Emitter Cut-Off Current	I_{CEX}		10	nA	$V_{CE}=60V$, $V_{EB(off)}=3V$
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$		0.3	V	$I_C=150mA$, $I_B=15mA$*
			1.0	V	$I_C=500mA$, $I_B=50mA$*
Base-Emitter Saturation Voltage	$V_{BE(sat)}$	0.6	1.2	V	$I_C=150mA$, $I_B=15mA$*
			2.0	V	$I_C=500mA$, $I_B=50mA$*
Static Forward Current Transfer Ratio	h_{FE}	35			$I_C=0.1mA$, $V_{CE}=10V$*
		50			$I_C=1mA$, $V_{CE}=10V$
		75			$I_C=10mA$, $V_{CE}=10V$*
		35			$I_C=10mA$, $V_{CE}=10V$, $T_{amb}=-55°C$
		100	300		$I_C=150mA$, $V_{CE}=10V$*
		50			$I_C=150mA$, $V_{CE}=1V$*
		40			$I_C=500mA$, $V_{CE}=10V$*

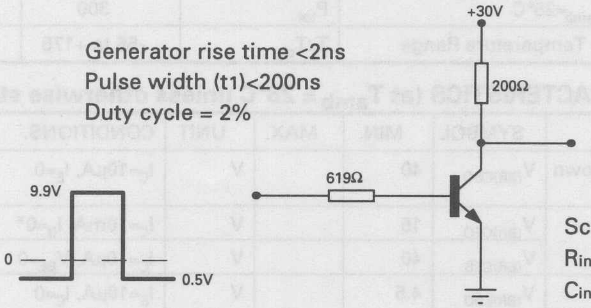
*Measured under pulsed conditions. Pulse width=300μs. Duty cycle ≤ 2%

MPS2222A

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Transition Frequency	f_T	300			MHz	I_C=20mA, V_{CE}=20V f=100MHz
Output Capacitance	C_{obo}			8	pF	V_{CB}=10V, I_E=0, f=140KHz
Input Capacitance	C_{ibo}			25	pF	V_{EB}=0.5V, I_C=0 f=140KHz
Delay Time	t_d			10	ns	V_{CE}=30V, $V_{BE(off)}$=0.5V I_C=150mA, I_{B1}=15mA (See Delay Test Circuit)
Rise Time	t_r			25	ns	
Storage Time	t_s			225	ns	V_{CE}=30V, I_C=150mA I_{B1}= I_{B2}=15mA (See Storage Test Circuit)
Fall Time	t_f			60	ns	

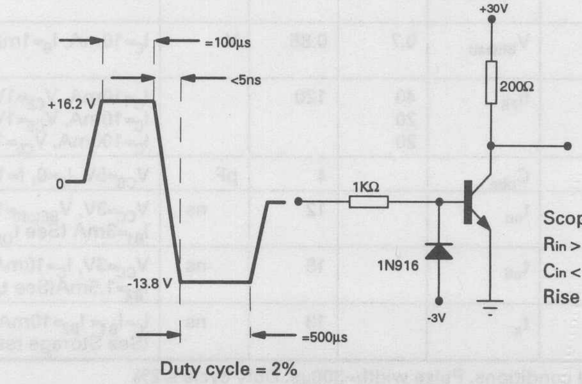
DELAY AND RISE – TEST CIRCUIT



Generator rise time <2ns
Pulse width (t1)<200ns
Duty cycle = 2%

Scope:
Rin > 100 kΩ
Cin < 12 pF
Rise Time < 5 ns

STORAGE TIME AND FALL TIME – TEST CIRCUIT



Duty cycle = 2%

Scope:
Rin > 100 kΩ
Cin < 12 pF
Rise Time < 5 ns

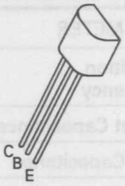
NPN SILICON PLANAR HIGH SPEED SWITCHING TRANSISTOR

MPS2369A

ISSUE 2 – MARCH 94

FEATURES

- 40 Volt V_{CEO}
- Very fast switching



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

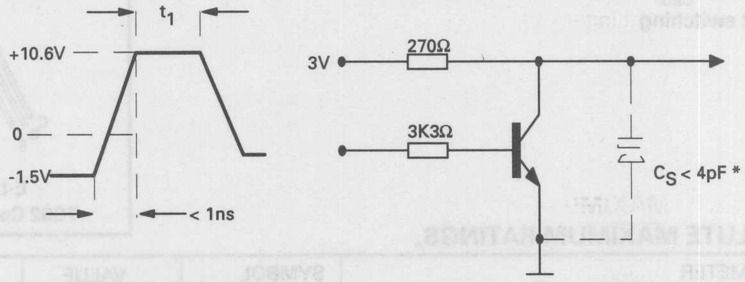
PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	40	V
Collector-Emitter Voltage	V_{CES}	40	V
Collector-Emitter Voltage	V_{CEO}	15	V
Emitter-Base Voltage	V_{EBO}	4.5	V
Continuous Collector Current	I_C	500	mA
Power Dissipation at T_{amb}=25°C	P_{tot}	300	mW
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +175	°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

PARAMETER	SYMBOL	MIN.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	40		V	I_C=10µA, I_E=0
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	15		V	I_C=10mA, I_B=0*
	$V_{(BR)CES}$	40		V	I_C=10µA, V_{BE}=0
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	4.5		V	I_E=10µA, I_C=0
Collector Cut-Off Current	I_{CBO}		25 30	nA µA	V_{CB}=20V, I_E=0 V_{CB}=20V, I_E=0, T_{amb}=150°C
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$		0.2	V	I_C=10mA, I_B=1mA*
Base-Emitter Saturation Voltage	$V_{BE(sat)}$	0.7	0.85	V	I_C=10mA, I_B=1mA*
Static Forward Current Transfer Ratio	h_{FE}	40 20 20	120		I_C=10mA, V_{CE}=1V* I_C=10mA, V_{CE}=1V, T_{amb}=-55°C* I_C=100mA, V_{CE}=1V*
Output Capacitance	C_{obo}		4	pF	V_{CB}=5V, I_E=0, f=140KHz
Turn-on Time	t_{on}		12	ns	V_{CC}=3V, $V_{BE(off)}$=1.5V I_C=10mA, I_{B1}=3mA (See t_{ON} circuit)
Turn-off Time	t_{off}		18	ns	V_{CC}=3V, I_C=10mA, I_{B1}=3mA I_{B2}=1.5mA(See t_{OFF} circuit)
Storage Time	t_s		13	ns	I_C=I_{B1}= I_{B2}=10mA (See Storage test circuit)

*Measured under pulsed conditions. Pulse width=300µs. Duty cycle ≤ 2%

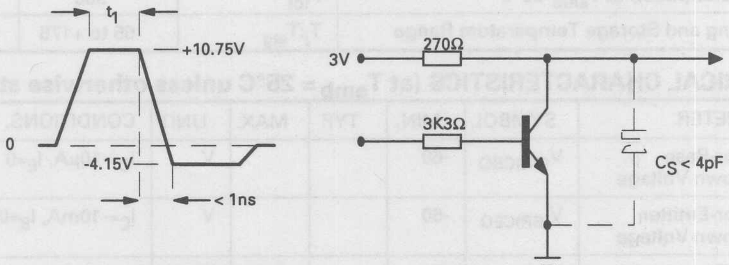
t_{ON} CIRCUIT



Pulse width (t1)=300ns

Duty cycle = 2%

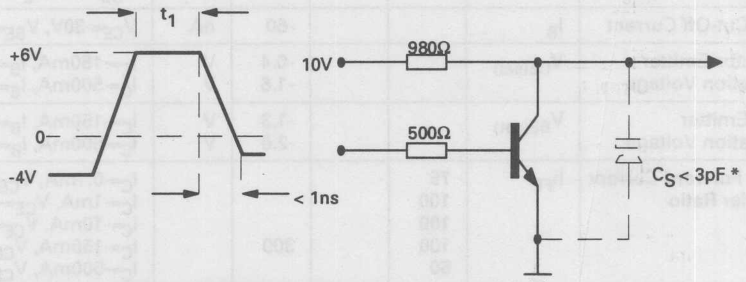
t_{OFF} CIRCUIT



Pulse width (t1)=300ns

Duty cycle = 2%

STORAGE TEST CIRCUIT



Pulse width (t1)=300ns

Duty cycle = 2%

* Total shunt capacitance of test jig and connectors

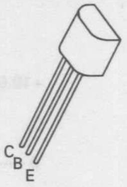
PNP SILICON PLANAR SWITCHING TRANSISTOR

MPS2907A

ISSUE 2 – SEPTEMBER 94

FEATURES

- 60 Volt V_{CEO}
- Fast switching



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	-60	V
Collector-Emitter Voltage	V_{CEO}	-60	V
Emitter-Base Voltage	V_{EBO}	-5	V
Continuous Collector Current	I_C	-600	mA
Power Dissipation at T_{amb}=25°C	P_{tot}	500	mW
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +175	°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	-60			V	I_C=-10µA, I_E=0
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	-60			V	I_C=-10mA, I_B=0*
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	-5			V	I_E=-10µA, I_C=0
Collector-Emitter Cut-Off Current	I_{CEX}			-50	nA	V_{CE}=-30V, V_{BE}=-0.5V
Collector Cut-Off Current	I_{CBO}			-10 -10	nA µA	V_{CB}=-50V, I_E=0 V_{CB}=-50V, I_E=0, T_{amb}=150°C
Base Cut-Off Current	I_B			-50	nA	V_{CE}=-30V, V_{BE}=-0.5V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$			-0.4 -1.6	V V	I_C=-150mA, I_B=-15mA* I_C=-500mA, I_B=-50mA*
Base-Emitter Saturation Voltage	$V_{BE(sat)}$			-1.3 -2.6	V V	I_C=-150mA, I_B=-15mA* I_C=-500mA, I_B=-50mA*
Static Forward Current Transfer Ratio	h_{FE}	75 100 100 100 50		 300 		I_C=-0.1mA, V_{CE}=-10V I_C=-1mA, V_{CE}=-10V I_C=-10mA, V_{CE}=-10V I_C=-150mA, V_{CE}=-10V* I_C=-500mA, V_{CE}=-10V*
Transition Frequency	f_T	200			MHz	I_C=-50mA, V_{CE}=-20V f=100MHz

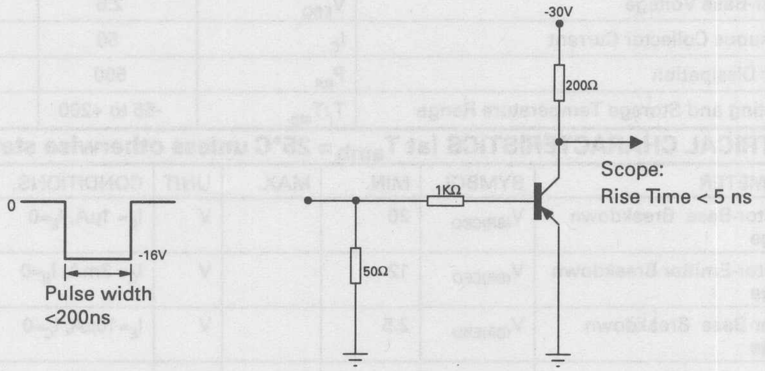
*Measured under pulsed conditions. Pulse width=300ms. Duty cycle ≤ 2%

MPS2907A

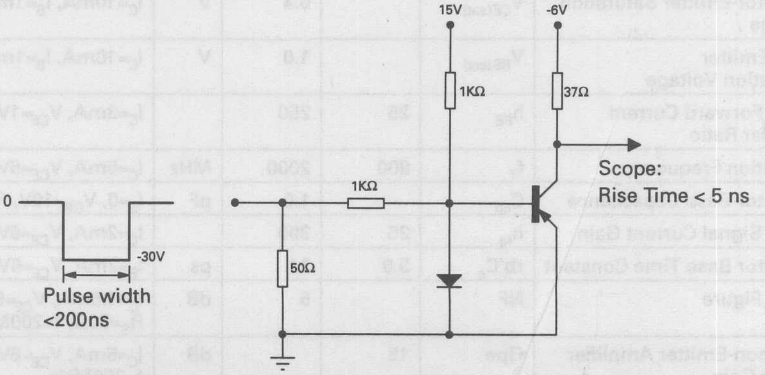
SWITCHING CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Output Capacitance	C_{obo}			8	pF	V_{CB}=-10V, I_E=0, f=100KHz
Input Capacitance	C_{ibo}			30	pF	V_{BE}=-2V, I_C=0 f=100KHz
Turn On Time	t_{on}			50	ns	V_{CE}=-30V I_C=-150mA, I_{B1}=-15mA (See Turn On Circuit)
Turn Off Time	t_{off}			110	ns	V_{CE}=-6V, I_C=-150mA I_{B1}= I_{B2}=-15mA (See Turn Off Circuit)

TURN ON TIME – TEST CIRCUIT



TURN OFF TIME – TEST CIRCUIT



NPN SILICON PLANAR
RF TRANSISTOR

ISSUE 3 – MARCH 1994

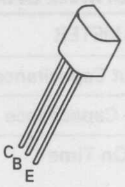
MPS5179

FEATURES

- High f_T=900MHz Min
- Max capacitance=1pF
- Low noise 5dB

APPLICATIONS

- Cordless telephones
- Keyless entry systems
- Wideband instrumentation amplifiers
- Wireless lans
- Remote metering
- Telemetry



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

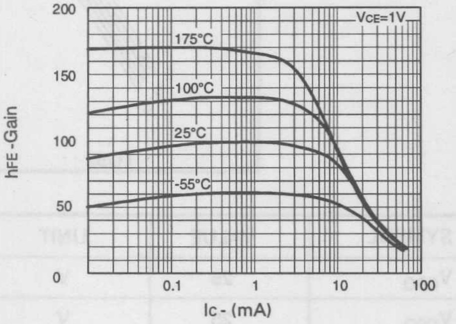
PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	20	V
Collector-Emitter Voltage	V_{CEO}	12	V
Emitter-Base Voltage	V_{EBO}	2.5	V
Continuous Collector Current	I_C	50	mA
Power Dissipation	P_{tot}	500	mW
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +200	°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

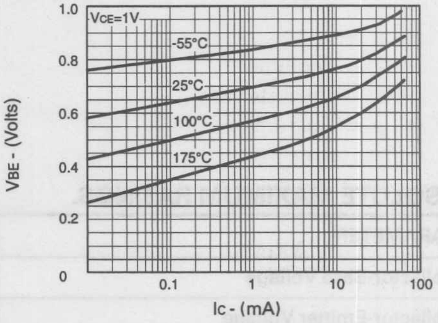
PARAMETER	SYMBOL	MIN.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	20		V	I_C= 1μA, I_E=0
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	12		V	I_C= 3mA, I_B=0
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	2.5		V	I_E=10μA, I_C=0
Collector Cut-Off Current	I_{CBO}		0.02 1.0	μA μA	V_{CB}=15V, I_E=0 V_{CB}=15V, I_E=0, T_{amb}=150°C
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$		0.4	V	I_C=10mA, I_B=1mA
Base-Emitter Saturation Voltage	$V_{BE(sat)}$		1.0	V	I_C=10mA, I_B=1mA
Static Forward Current Transfer Ratio	h_{FE}	25	250		I_C=3mA, V_{CE}=1V
Transition Frequency	f_T	900	2000	MHz	I_C=5mA, V_{CE}=6V, f=100MHz
Collector-Base Capacitance	C_{cb}		1.0	pF	I_E=0, V_{CB}=10V, f=1MHz
Small Signal Current Gain	h_{fe}	25	300		I_C=2mA, V_{CE}=6V, f=1KHz
Collector Base Time Constant	$rb'C_c$	3.0	14	ps	I_E=2mA, V_{CE}=6V, f=31.9MHz
Noise Figure	NF		5	dB	I_C=1.5mA, V_{CE}=6V R_S=50Ω, f=200MHz
Common-Emitter Amplifier Power Gain	Gpe	15		dB	I_C=5mA, V_{CE}=6V f=200MHz

MPS5179

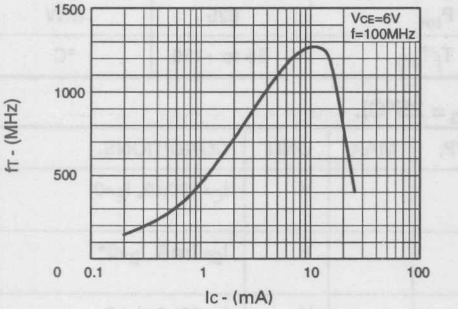
TYPICAL CHARACTERISTICS



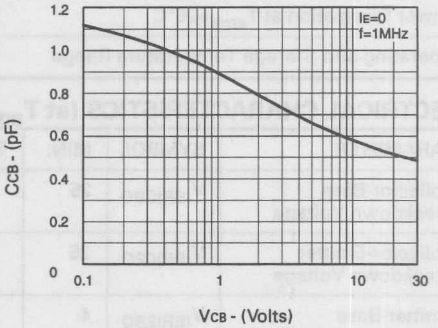
hFE v IC



VBE(on) v IC



fT v IC

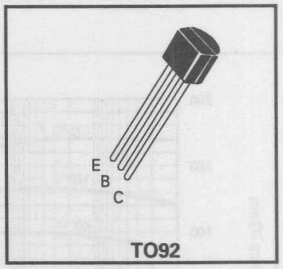


CCB v VCB

NPN SILICON PLANAR MEDIUM POWER TRANSISTOR

ISSUE 2 – NOVEMBER 94

MPS6601



ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	25	V
Collector-Emitter Voltage	V_{CEO}	25	V
Emitter-Base Voltage	V_{EBO}	4	V
Continuous Collector Current	I_C	1	A
Power Dissipation at T_{amb}=25°C	P_{tot}	625	mW
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +150	°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C).

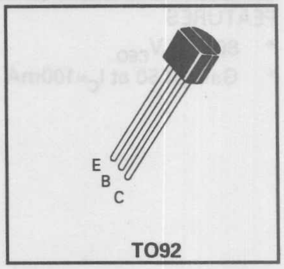
PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	25			V	I_C=100µA, I_E=0
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	25			V	I_C=1mA, I_B=0*
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	4			V	I_E=10µA, I_C=0
Collector Cut-Off Current	I_{CBO}			0.1	µA	V_{CB}=25V, I_E=0
Collector Cut-Off Current	I_{CES}			0.1	µA	V_{CE}=25V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$			0.6	V	I_C=1A, I_B=100mA*
Base-Emitter Turn-On Voltage	$V_{BE(on)}$			1.2	V	I_C=500mA, V_{CE}=1V*
Static Forward Current Transfer Ratio	h_{FE}	50 50 30				I_C=100mA, V_{CE}=1V* I_C=500mA, V_{CE}=1V* I_C=1A, V_{CE}=1V*
Transition Frequency	f_T	100			MHz	I_C=50mA, V_{CE}=10V f=100MHz

*Measured under pulsed conditions. Pulse width=300µs. Duty cycle ≤2%

PNP SILICON PLANAR MEDIUM POWER TRANSISTOR

ISSUE 2 – NOVEMBER 94

MPS6651



ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	-25	V
Collector-Emitter Voltage	V_{CEO}	-25	V
Emitter-Base Voltage	V_{EBO}	-4	V
Continuous Collector Current	I_C	-1	A
Power Dissipation at T_{amb}=25°C	P_{tot}	625	mW
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +150	°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C).

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	-25			V	I_C=-100μA, I_E=0
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	-25			V	I_C=-1mA, I_B=0*
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	-4			V	I_E=-10μA, I_C=0
Collector Cut-Off Current	I_{CBO}			-0.1	μA	V_{CB}=-25V, I_E=0
Collector Cut-Off Current	I_{CEO}			-0.1	μA	V_{CE}=-25V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$			-0.6	V	I_C=-1A, I_B=-100mA*
Base-Emitter Turn-On Voltage	$V_{BE(on)}$			-1.2	V	I_C=-500mA, V_{CE}=-1V*
Static Forward Current Transfer Ratio	h_{FE}	50 50 30				I_C=-100mA, V_{CE}=-1V* I_C=-500mA, V_{CE}=-1V* I_C=-1A, V_{CE}=-1V*
Transition Frequency	f_T	100			MHz	I_C=-50mA, V_{CE}=-10V f=100MHz

*Measured under pulsed conditions. Pulse width=300μs. Duty cycle ≤2%

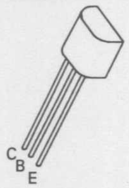
NPN SILICON PLANAR MEDIUM POWER TRANSISTOR

MPSA06

ISSUE 2 – FEB 94

FEATURES

- 80 Volt V_{CEO}
- Gain of 50 at I_C=100mA



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	80	V
Collector-Emitter Voltage	V_{CEO}	80	V
Emitter-Base Voltage	V_{EBO}	4	V
Continuous Collector Current	I_C	500	mA
Power Dissipation at T_{amb}=25°C	P_{tot}	750	mW
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +175	°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C).

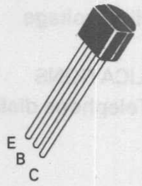
PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	80			V	I_C=100µA, I_E=0
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	80			V	I_C=1mA, I_B=0*
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	4			V	I_E=100µA, I_C=0
Collector Cut-Off Current	I_{CBO}			0.1	µA	V_{CB}=80V, I_E=0
Collector Cut-Off Current	I_{CES}			0.1	µA	V_{CE}=60V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$			0.25	V	I_C=100mA, I_B=10mA*
Base-Emitter Turn-On Voltage	$V_{BE(on)}$			1.2	V	I_C=100mA, V_{CE}=1V*
Static Forward Current Transfer Ratio	h_{FE}	50 50				I_C=10mA, V_{CE}=1V* I_C=100mA, V_{CE}=1V*
Transition Frequency	f_T	100			MHz	I_C=10mA, V_{CE}=2V f=100MHz

*Measured under pulsed conditions. Pulse width=300µs. Duty cycle ≤2%

NPN SILICON PLANAR MEDIUM POWER DARLINGTON TRANSISTOR

ISSUE 2 – NOV 93

MPSA12P



TO92

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Emitter Voltage	V_{CES}	20	V
Emitter-Base Voltage	V_{EBO}	10	V
Continuous Collector Current	I_C	500	mA
Power Dissipation at T_{amb}=25°C	P_{tot}	625	mW
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +150	°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C).

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Emitter Breakdown Voltage	$V_{(BR)CES}$	20			V	I_C=100μA, I_B=0*
Collector Cut-Off Current	I_{CES}			100	nA	V_{CE}=15V, V_{BE}=0
Collector Cut-Off Current	I_{CBO}			100	nA	V_{CB}=15V, I_E=0
Emitter Cut-Off Current	I_{EBO}			100	nA	V_{EB}=10V, I_C=0
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$			1	V	I_C=10mA, I_B=0.01mA
Base-Emitter Saturation Voltage	$V_{BE(on)}$			1.4	V	I_C=10mA, V_{CE}=5V*
Static Forward Current Transfer Ratio	h_{FE}	20K				I_C=10mA, V_{CE}=5V*

*Measured under pulsed conditions. Pulse width =300μs. Duty cycle ≤ 2%

NPN SILICON PLANAR
HIGH VOLTAGE TRANSISTOR

MPSA42

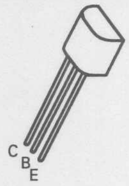
ISSUE 2 – MARCH 94

FEATURES

- High voltage

APPLICATIONS

- Telephone dialler circuit



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	300	V
Collector-Emitter Voltage	V_{CEO}	300	V
Emitter-Base Voltage	V_{EBO}	6	V
Continuous Collector Current	I_C	500	mA
Power Dissipation at T_{amb}=25°C	P_{tot}	680	mW
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +175	°C

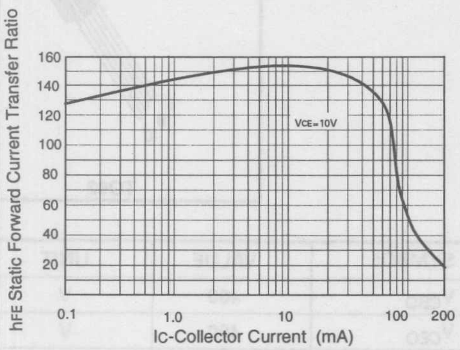
ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C).

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	300			V	I_C=100μA, I_E=0
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	300			V	I_C=1mA, I_B=0*
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	6			V	I_E=100μA, I_C=0
Collector Cut-Off Current	I_{CBO}			0.1	μA	V_{CB}=200V, I_E=0
Emitter Cut-Off Current	I_{EBO}			0.1	μA	V_{EB}=6V, I_C=0
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$			0.5	V	I_C=20mA, I_B=2mA*
Base-Emitter Saturation Voltage	$V_{BE(sat)}$			0.9	V	I_C=20mA, I_B=2mA*
Static Forward Current Transfer Ratio	h_{FE}	25 40 40				I_C=1mA, V_{CE}=10V* I_C=10mA, V_{CE}=10V* I_C=30mA, V_{CE}=10V*
Transition Frequency	f_T	50			MHz	I_C=10mA, V_{CE}=20V f=20MHz
Output Capacitance	C_{obo}			6	pF	V_{CB}=20V, f=1MHz

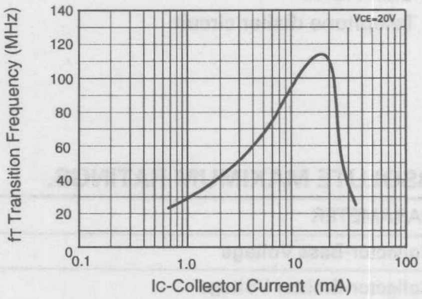
*Measured under pulsed conditions. Pulse width=300μs. Duty cycle ≤2%

MPSA42

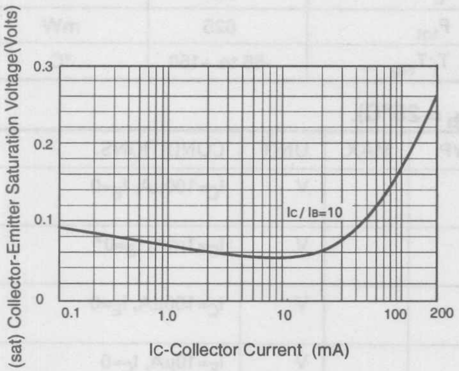
TYPICAL CHARACTERISTICS



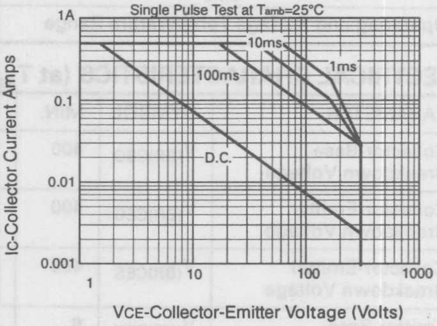
hFE vs IC



fT vs IC



VCE(sat) vs IC



Safe operating area

NPN SILICON PLANAR HIGH VOLTAGE TRANSISTOR

MPSA44

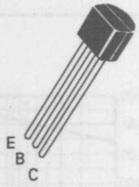
ISSUE 2 – MARCH 94

FEATURES

* High voltage

APPLICATIONS

* Telephone dialler circuit



TO92

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	400	V
Collector-Emitter Voltage	V_{CEO}	400	V
Emitter-Base Voltage	V_{EBO}	6	V
Continuous Collector Current	I_C	300	mA
Power Dissipation at T_{amb}=25°C	P_{tot}	625	mW
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +150	°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C).

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	400			V	I_C=100µA, I_E=0
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	400			V	I_C=1mA, I_B=0*
Collector-Emitter Breakdown Voltage	$V_{(BR)CES}$	400			V	I_C=100µA, I_E=0
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	6			V	I_E=10µA, I_C=0
Collector Cut-Off Current	I_{CBO}			0.1	µA	V_{CB}=400V, I_E=0
Collector Cut-Off Current	I_{CES}			500	nA	V_{CE}=400V
Emitter Cut-Off Current	I_{EBO}			0.1	µA	V_{EB}=4V, I_C=0
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$			0.4 0.5 0.75	V	I_C=1mA, I_B=0.1mA* I_C=10mA, I_B=1mA* I_C=50mA, I_B=5mA*
Base-Emitter Saturation Voltage	$V_{BE(sat)}$			0.75	V	I_C=10mA, I_B=1mA*
Static Forward Current Transfer Ratio	h_{FE}	40 50 45 40		 300		I_C=1mA, V_{CE}=10V* I_C=10mA, V_{CE}=10V* I_C=50mA, V_{CE}=10V* I_C=100mA, V_{CE}=10V*

*Measured under pulsed conditions. Pulse width=300µs. Duty cycle ≤2%

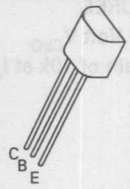
PNP SILICON PLANAR MEDIUM POWER TRANSISTOR

MPSA56

ISSUE 2 – FEB 94

FEATURES

- * 80 Volt V_{CEO}
- * Gain of 50 at I_C=100mA



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	-80	V
Collector-Emitter Voltage	V_{CEO}	-80	V
Emitter-Base Voltage	V_{EBO}	-4	V
Continuous Collector Current	I_C	-500	mA
Power Dissipation at T_{amb}=25°C	P_{tot}	750	mW
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +175	°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C).

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	-80			V	I_C=-100μA, I_E=0
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	-80			V	I_C=-1mA, I_B=0*
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	-4			V	I_E=-100μA, I_C=0
Collector Cut-Off Current	I_{CBO}			-0.1	μA	V_{CB}=-80V, I_E=0
Collector Cut-Off Current	I_{CES}			-0.1	μA	V_{CE}=-60V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$			-0.25	V	I_C=-100mA, I_B=-10mA*
Base-Emitter Turn-On Voltage	$V_{BE(on)}$			-1.2	V	I_C=-100mA, V_{CE}=-1V*
Static Forward Current Transfer Ratio	h_{FE}	50 50				I_C=-10mA, V_{CE}=1V* I_C=-100mA, V_{CE}=1V*
Transition Frequency	f_T	100			MHz	I_C=-10mA, V_{CE}=-2V f=100MHz

*Measured under pulsed conditions. Pulse width=300μs. Duty cycle ≤2%

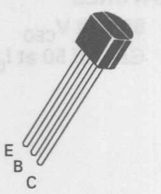
PNP SILICON PLANAR MEDIUM POWER DARLINGTON TRANSISTOR

MPSA77

ISSUE 1 – JUNE 94

FEATURES

- 60 Volt V_{CEO}
- Gain of 10k at I_C=100mA



TO92

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	-60	V
Collector-Emitter Voltage	V_{CEO}	-60	V
Emitter-Base Voltage	V_{EBO}	-10	V
Continuous Collector Current	I_C	-500	mA
Power Dissipation at T_{amb}=25°C	P_{tot}	625	mW
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +150	°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C).

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	-60			V	I_C=-100µA, I_E=0
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	-60			V	I_C=-100µA, I_B=0*
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	-10			V	I_E=-10µA, I_C=0
Collector Cut-Off Current	I_{CBO}			-100	nA	V_{CB}=-50V, I_E=0
Collector Cut-Off Current	I_{CES}			-500	nA	V_{CE}=-50V
Emitter Cut-Off Current	I_{EBO}			-100	nA	V_{EB}=-10V, I_C=0
Collector-Emitter On Voltage	$V_{CE(sat)}$			-1.5	V	I_C=-100mA, I_B=-0.1mA*
Base-Emitter Saturation Voltage	$V_{BE(on)}$			-2	V	I_C=-100mA, V_{CE}=-5V*
Static Forward Current Transfer Ratio	h_{FE}	10k 10k				I_C=-10mA, V_{CE}=-5V* I_C=-100mA, V_{CE}=5V*

*Measured under pulsed conditions. Pulse width=300µs. Duty cycle ≤2%

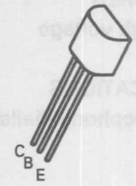
PNP SILICON PLANAR MEDIUM POWER DARLINGTON TRANSISTOR

MPSA77P

ISSUE 1 – JUNE 94

FEATURES

- 60 Volt V_{CEO}
- Gain of 10k at I_C=100mA



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	-60	V
Collector-Emitter Voltage	V_{CEO}	-60	V
Emitter-Base Voltage	V_{EBO}	-10	V
Continuous Collector Current	I_C	-500	mA
Power Dissipation at T_{amb}=25°C	P_{tot}	625	mW
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +200	°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C).

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	-60			V	I_C=-100μA, I_E=0
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	-60			V	I_C=-100μA, I_B=0*
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	-10			V	I_E=-10μA, I_C=0
Collector Cut-Off Current	I_{CBO}			-100	nA	V_{CB}=-50V, I_E=0
Collector Cut-Off Current	I_{CES}			-500	nA	V_{CE}=-50V
Emitter Cut-Off Current	I_{EBO}			-100	nA	V_{EB}=-10V, I_C=0
Collector-Emitter On Voltage	$V_{CE(sat)}$			-1.5	V	I_C=-100mA, I_B=-0.1mA*
Base-Emitter Saturation Voltage	$V_{BE(on)}$			-2	V	I_C=-100mA, V_{CE}=-5V*
Static Forward Current Transfer Ratio	h_{FE}	10k 10k				I_C=-10mA, V_{CE}=-5V* I_C=-100mA, V_{CE}=-5V*

*Measured under pulsed conditions. Pulse width=300μs. Duty cycle ≤2%

PNP SILICON PLANAR
HIGH VOLTAGE TRANSISTOR

MPSA92

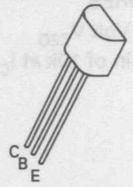
ISSUE2 – MARCH 94

FEATURES

* High voltage

APPLICATIONS

* Telephone dialler circuits



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	-300	V
Collector-Emitter Voltage	V_{CEO}	-300	V
Emitter-Base Voltage	V_{EBO}	-5	V
Continuous Collector Current	I_C	-500	mA
Power Dissipation at T_{amb} = 25°C	P_{tot}	680	mW
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +175	°C

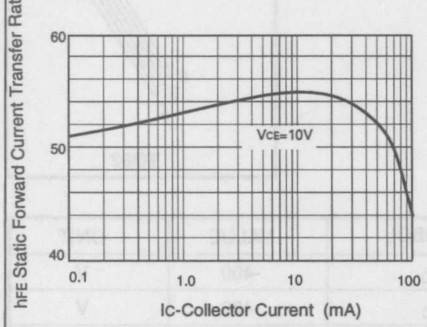
ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C).

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	-300			V	I_C=-100μA, I_E=0
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	-300			V	I_C=-1mA, I_B=0*
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	-5			V	I_E=-10μA, I_C=0
Collector Cut-Off Current	I_{CBO}			-0.25	μA	V_{CB}=-200V, I_E=0
Emitter Cut-Off Current	I_{EBO}			-0.1	μA	V_{EB}=-3V, I_E=0
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$			-0.5	V	I_C=-20mA, I_B=-2mA*
Base-Emitter Saturation Voltage	$V_{BE(sat)}$			-0.9	V	I_C=-20mA, I_B=-2mA*
Static Forward Current Transfer Ratio	h_{FE}	25 40 25				I_C=-1mA, V_{CE}=10V* I_C=-10mA, V_{CE}=10V* I_C=-30mA,V_{CE}=-10V*
Transition Frequency	f_T	50			MHz	I_C=-10mA, V_{CE}=-20V f=20MHz
Output Capacitance	C_{obo}			6	pF	V_{CB}=-20V, f=1MHz

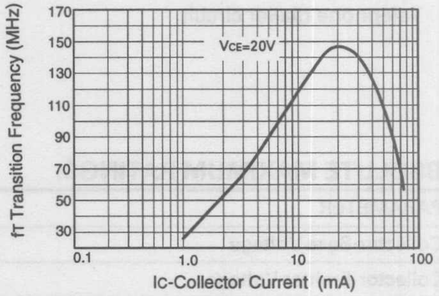
*Measured under pulsed conditions. Pulse width=300μs. Duty cycle ≤2%

MPSA92

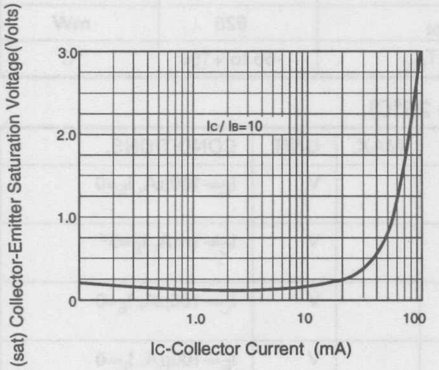
TYPICAL CHARACTERISTICS



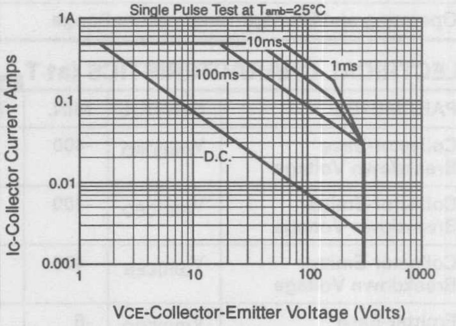
hFE vs IC



fT vs IC



VCE(sat) vs IC



Safe operating area

PNP SILICON PLANAR HIGH VOLTAGE TRANSISTOR

ISSUE 2 – MARCH 94

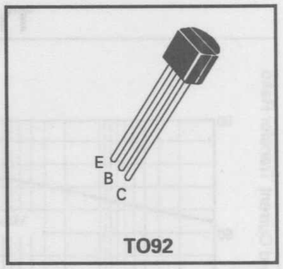
MPSA94

FEATURES

* High voltage

APPLICATIONS

* Telephone dialler circuit



ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	-400	V
Collector-Emitter Voltage	V_{CEO}	-400	V
Emitter-Base Voltage	V_{EBO}	-6	V
Continuous Collector Current	I_C	-300	mA
Power Dissipation at T_{amb}=25°C	P_{tot}	625	mW
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +150	°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C).

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	-400			V	I_C=-100μA, I_E=0
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	-400			V	I_C=-1mA, I_B=0*
Collector-Emitter Breakdown Voltage	$V_{(BR)CES}$	-400			V	I_C=-100μA, I_E=0
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	-6			V	I_E=-100μA, I_C=0
Collector Cut-Off Current	I_{CBO}			-0.1	μA	V_{CB}=-400V, I_E=0
Collector Cut-Off Current	I_{CES}			-500	nA	V_{CE}=-400V
Emitter Cut-Off Current	I_{EBO}			-0.1	μA	V_{EB}=-4V, I_C=0
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$			-0.4 -0.5 -0.75	V	I_C=-1mA, I_B=-0.1mA* I_C=-10mA, I_B=-1mA* I_C=-50mA, I_B=-5mA*
Base-Emitter Saturation Voltage	$V_{BE(sat)}$			-0.75	V	I_C=-10mA, I_B=-1mA*
Static Forward Current Transfer Ratio	h_{FE}	40 50 45 40		300		I_C=-1mA, V_{CE}=-10V* I_C=-10mA, V_{CE}=-10V* I_C=-50mA, V_{CE}=-10V* I_C=-100mA, V_{CE}=-10V*

*Measured under pulsed conditions. Pulse width=300μs. Duty cycle ≤2%

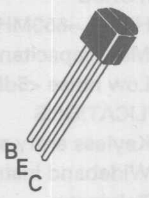
NPN SILICON PLANAR RF TRANSISTOR

MPSH10

ISSUE 3 – NOVEMBER 94

FEATURES

- High f_T=650MHz
- Maximum capacitance 0.7pF
- Low noise < 5dB at 500MHz



TO92

REFER TO MPSH10P FOR GRAPHS

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Emitter Voltage	V_{CES}	30	V
Collector-Emitter Voltage	V_{CEO}	25	V
Emitter-Base Voltage	V_{EBO}	3	V
Continuous Collector Current	I_C	25	mA
Power Dissipation at T_{amb}=25°C	P_{tot}	350	mW
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +150	°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C)

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	30			V	I_C=100µA, I_E=0
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	25			V	I_C=1mA, I_B=0
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	3			V	I_E=10µA, I_C=0
Collector Cut-Off Current	I_{CBO}			100	nA	V_{CB}=25V, I_E=0
Emitter Cut-Off Current	I_{EBO}			100	nA	V_{EB}=2V,I_C=0
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$			0.5	V	I_C=4mA, I_B=0.4mA
Base-Emitter Turn-On Voltage	$V_{BE(on)}$			0.95	V	I_C=4mA, V_{CE}=10V
Static Forward Current Transfer Ratio	h_{FE}	60				I_C=4mA, V_{CE}=10V*
Transition Frequency	f_T	650			MHz	I_C=4mA, V_{CE}=10V, f=100MHz
Collector Base Capacitance	C_{cb}			0.7	pF	V_{CB}=10V, I_E=0 f=1MHz
Collector Base Time Constant	r_bC_c			9	ps	I_C=4mA, V_{CE}=10V, f=31.8MHz

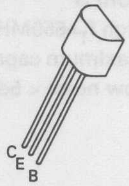
NPN SILICON PLANAR
RF TRANSISTOR

MPSH10P

ISSUE 4 – FEB 94

FEATURES
- High f_T=650MHz min
- Max. capacitance 0.7pF
- Low noise <5dB at 500MHz

APPLICATIONS
- Keyless entry systems
- Wideband instrumentation amplifiers
- Telemetry
- Wireless lans



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	30	V
Collector-Emitter Voltage	V_{CEO}	25	V
Emitter-Base Voltage	V_{EBO}	3	V
Continuous Collector Current	I_C	25	mA
Power Dissipation at T_{amb}=25°C	P_{tot}	500	mW
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +200	°C

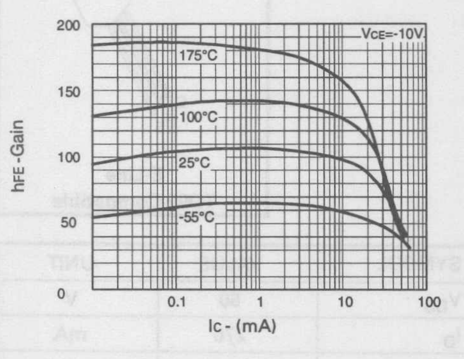
ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C)

PARAMETER	SYMBOL	MIN.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	30		V	I_C=100µA, I_E=0
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	25		V	I_C=1mA, I_B=0*
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	3		V	I_E=10µA, I_C=0
Collector Cut-Off Current	I_{CBO}		100	nA	V_{CB}=25V, I_E=0
Emitter Cut-Off Current	I_{EBO}		100	nA	V_{EB}=2V,I_C=0
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$		0.5	V	I_C=4mA, I_B=0.4mA
Base-Emitter Turn-On Voltage	$V_{BE(on)}$		0.95	V	I_C=4mA, V_{CE}=10V
Static Forward Current Transfer Ratio	h_{FE}	60			I_C=4mA, V_{CE}=10V*
Transition Frequency	f_T	650		MHz	I_C=4mA, V_{CE}=10V f=100MHz
Collector Base Capacitance	C_{cb}		0.7	pF	V_{CB}=10V, I_E=0, f=1MHz
Collector Base Time Constant	r_bC_c		9	ps	V_{CB}=10V, I_C=4mA, f=31.8MHz
Common-Base Feedback capacitance	C_{rb}		0.65	pF	V_{CB}=10V, I_E=0, f=1MHz
Noise Figure	N_f		5	dB	I_C=2mA, V_{CE}=5V, R_S=50Ω, f=500MHz

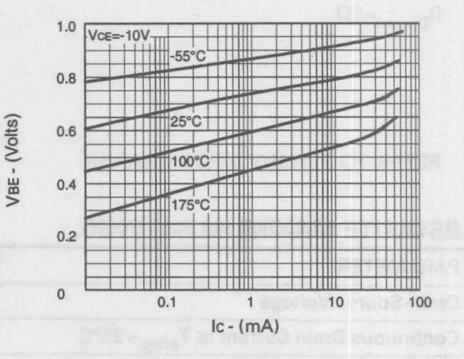
*Measured under pulsed conditions. Pulse width=300µs. Duty cycle ≤2%

MPSH10P

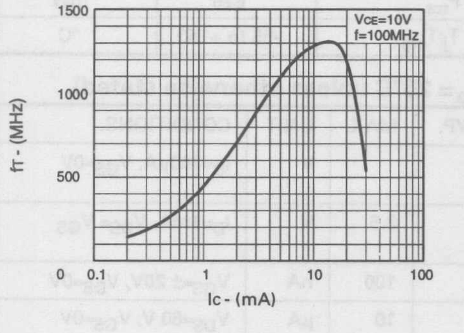
TYPICAL CHARACTERISTICS



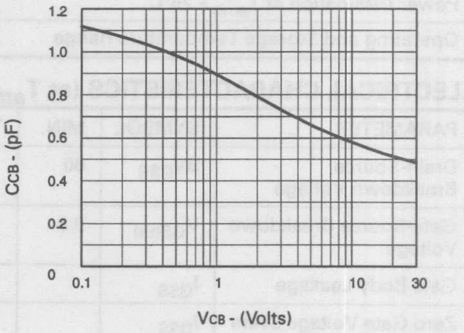
hFE v IC



VBE(on) v IC



fT v IC



CCB v VCB

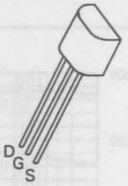
N-CHANNEL ENHANCEMENT MODE VERTICAL DMOS FET

ISSUE 1 – FEB 94

VN10LP

FEATURES

- 60 Volt V_{DS}
- $R_{DS(on)}$=5Ω



E-Line
TO92 Compatible

REFER TO ZVN3306A FOR GRAPHS

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Drain-Source Voltage	V_{DS}	60	V
Continuous Drain Current at T_{amb} = 25°C	I_D	270	mA
Pulsed Drain Current	I_{DM}	3	A
Gate Source Voltage	V_{GS}	± 20	V
Power Dissipation at T_{amb} = 25°C	P_{tot}	625	mW
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +150	°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

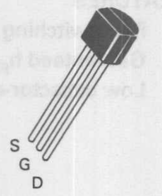
PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Drain-Source Breakdown Voltage	BV_{DSS}	60			V	I_D=100μA, V_{GS}=0V
Gate-Source Breakdown Voltage	$V_{GS(th)}$	0.8		2.5	V	I_D=1mA, V_{DS}= V_{GS}
Gate Body Leakage	I_{GSS}			100	nA	V_{GS}=± 20V, V_{DS}=0V
Zero Gate Voltage Drain Current (1)	I_{DSS}			10	μA	V_{DS}=60 V, V_{GS}=0V
On State Drain Current(1)	$I_{D(on)}$	750			mA	V_{DS}=15 V, V_{GS}=10V
Static Drain Source On State Resistance (1)	$R_{DS(on)}$			5.0 7.5	Ω Ω	V_{GS}=10V,I_D=500mA V_{GS}=5V, I_D=200mA
Forward Transconductance (1)(2)	g_{fs}	100			mS	V_{DS}=15V,I_D=500mA
Input Capacitance (2)	C_{iss}			60	pF	V_{DS}=25 V, V_{GS}=0V f=1MHz
Common Source Output Capacitance (2)	C_{oss}			25	pF	
Reverse Transfer Capacitance (2)	C_{rss}			5	pF	
Turn-On Time (2)(3)	$t_{(on)}$			10	ns	V_{DD}≈15V, I_D=600mA
Turn-Off Time (2)(3)	$t_{(off)}$			10	ns	

(1) Measured under pulsed conditions. Width=300μs. Duty cycle ≤2% (2) Sample test.
(3) Switching times measured with 50Ω source impedance and <5ns rise time on a pulse generator

N-CHANNEL ENHANCEMENT MODE VERTICAL DMOS FET

ISSUE 2 – FEB 94

VN2222LL



TO92

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Drain-Source Voltage	V_{DS}	60	V
Continuous Drain Current at T_{amb} = 25°C	I_D	150	mA
Pulsed Drain Current	I_{DM}	1	A
Gate Source Voltage	V_{GS}	± 40	V
Power Dissipation at T_{amb} = 25°C	P_{tot}	400	mW
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +150	°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

PARAMETER	SYMBOL	MIN.	MAX.	UNIT	CONDITIONS.
Drain-Source Breakdown Voltage	BV_{DSS}	60		V	I_D=100µA, V_{GS}=0V
Gate-Source Breakdown Voltage	$V_{GS(th)}$	0.6	2.5	V	I_D=1mA, V_{DS}= V_{GS}
Gate Body Leakage	I_{GSS}		100	nA	V_{GS}=± 30V, V_{DS}=0V
Zero Gate Voltage Drain Current (1)	I_{DSS}		10 500	µA µA	V_{DS}=48 V, V_{GS}=0V V_{DS}=48 V, V_{GS}=0V, T=125°C
On State Drain Current(1)	$I_{D(on)}$	750		mA	V_{DS}=10 V, V_{GS}=10V
Static Drain Source On State Voltage (1)	$V_{DS(on)}$		3.75 1.50	V V	V_{GS}=10V,I_D=500mA V_{GS}=5V, I_D=200mA
Static Drain Source On State Resistance (1)	$R_{DS(on)}$		7.5	Ω	V_{GS}=10V,I_D=500mA
Forward Transconductance (1)(2)	g_{fs}	100		mS	V_{DS}=10V,I_D=500mA
Input Capacitance (2)	C_{iss}		60	pF	V_{DS}=25 V, V_{GS}=0V f=1MHz
Common Source Output Capacitance (2)	C_{oss}		25	pF	
Reverse Transfer Capacitance (2)	C_{rss}		5	pF	
Turn-On Time (2)(3)	$t_{(on)}$		10	ns	V_{DD}≈15V, I_D=600mA
Turn-Off Time (2)(3)	$t_{(off)}$		10	ns	

(1) Measured under pulsed conditions. Width=300µs. Duty cycle ≤2%, (2) Sample test.
(3) Switching times measured with 50Ω source impedance and <5ns rise time on a pulse generator

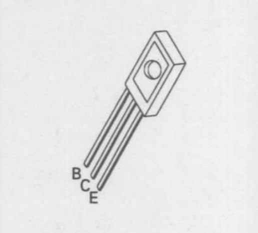
NPN SILICON PLANAR POWER TRANSISTOR

ZBD849

PROVISIONAL DATASHEET ISSUE A – MARCH 94

FEATURES

- Fast switching
- Guaranteed h_{FE} specified up to 20 Amps
- Low collector-emmiter saturation voltage



TO126

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	80	V
Collector-Emitter Voltage	V_{CEO}	30	V
Emitter-Base Voltage	V_{EBO}	6	V
Peak Pulse Current	I_{CM}	20	A
Continuous Collector Current	I_C	5	A
Power Dissipation at T_{amb}=25°C	P_{tot}	2	W
Power Dissipation at T_{case}=25°C	P_{tot}	25	W
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +200	°C

THERMAL CHARACTERISTICS

PARAMETER	SYMBOL	MAX	UNIT
Thermal Resistance			
Junction To Ambient	$R_{th(j-amb)}$	75	°C/W
Junction To Case	$R_{th(j-case)}$	7	°C/W

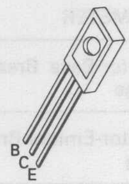
ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated)

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	80	120		V	I_C=100μA
Collector-Emitter Breakdown Voltag	$V_{(BR)CER}$	80	120		V	I_C=1μA, RB ≤1KΩ
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	30	40		V	I_C=10mA
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	6	8		V	I_E=100μA
Collector Cut-Off Current	I_{CBO}			50 1	nA μA	V_{CB}=70V V_{CB}=70V, T_{amb}=100°C
Collector Cut-Off Current	I_{CER} R ≤1KΩ			50 1	nA μA	V_{CB}=70V V_{CB}=70V, T_{amb}=100°C
Emitter Cut-Off Current	I_{EBO}			10	nA	V_{EB}=6V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$			50 100 200 280	mV mV mV mV	I_C=0.5A, I_B=20mA I_C=1A, I_B=20mA I_C=2A, I_B=20mA I_C=5A, I_B=200mA*
Base-Emitter Saturation Voltage	$V_{BE(sat)}$		970	1150	mV	I_C=5A, I_B=200mA*
Base-Emitter Turn-On Voltage	$V_{BE(on)}$		890	1000	mV	I_C=5A, V_{CE}=1V*
Static Forward Current Transfer Ratio	h_{FE}	100 100 100 30	200 200 170 65	 300		I_C=10mA, V_{CE}=1V I_C=1A, V_{CE}=1V* I_C=5A, V_{CE}=1V* I_C=20A, V_{CE}=2V*
Transition Frequency	f_T		100		MHz	I_C=100mA, V_{CE}=10V f=50MHz
Output Capacitance	C_{obo}		75		pF	V_{CB}=10V, f=1MHz
Switching Times	t_{on}		45		ns	I_C=1A, I_{B1}=100mA I_{B2}=100mA, V_{CC}=10V
	t_{off}		630		ns	

*Measured under pulsed conditions. Pulse width=300μs. Duty cycle ≤2%

FEATURES

- * Fast switching
- * Guaranteed h_{FE} specified up to 4 Amps
- * Low collector-emitter saturation voltage



TO126

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	200	V
Collector-Emitter Voltage	V_{CEO}	100	V
Emitter-Base Voltage	V_{EBO}	6	V
Peak Pulse Current	I_{CM}	10	A
Continuous Collector Current	I_C	4	A
Power Dissipation at T_{amb}=25°C	P_{tot}	2	W
Power Dissipation at T_{case}=25°C	P_{tot}	25	W
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +200	°C

THERMAL CHARACTERISTICS

PARAMETER	SYMBOL	MAX	UNIT
Thermal Resistance			
Junction To Ambient	$R_{th(j\text{-}amb)}$	75	°C/W
Junction To Case	$R_{th(j\text{-}case)}$	7	°C/W

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C)

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	200	300		V	I_C=100μA
Collector-Emitter Breakdown Voltag	$V_{(BR)CER}$	200	300		V	I_C=1μA, RB ≤1KΩ
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	100	120		V	I_C=10mA*
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	6	8		V	I_E=100μA
Collector Cut-Off Current	I_{CBO}			50 1	nA μA	V_{CB}=150V V_{CB}=150V, T_{amb}=100°C
Collector Cut-Off Current	I_{CER} R ≤1KΩ			50 1	nA μA	V_{CB}=150V V_{CB}=150V, T_{amb}=100°C
Emitter Cut-Off Current	I_{EBO}			10	nA	V_{EB}=6V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$			50 150 250	mV mV mV	I_C=0.1A, I_B=5mA I_C=2A, I_B=100mA I_C=4A, I_B=400mA*
Base-Emitter Saturation Voltage	$V_{BE(sat)}$		1000	1200	mV	I_C=4A, I_B=400mA*
Base-Emitter Turn-On Voltage	$V_{BE(on)}$		860	1000	mV	I_C=4A, V_{CE}=2V*
Static Forward Current Transfer Ratio	h_{FE}	100 100 50 20	200 200 100 30	 300		I_C=10mA, V_{CE}=2V I_C=2A, V_{CE}=2V* I_C=4A, V_{CE}=2V* I_C=10A, V_{CE}=2V*
Transition Frequency	f_T		130		MHz	I_C=100mA, V_{CE}=10V f=50MHz
Output Capacitance	C_{obo}		35		pF	V_{CB}=10V, f=1MHz
Switching Times	t_{on}		50		ns	I_C=1A, I_{B1}=100mA I_{B2}=100mA, V_{CC}=10V
	t_{off}		1650		ns	

*Measured under pulsed conditions. Pulse width=300μs. Duty cycle ≤2%

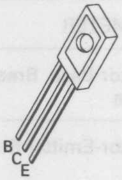
NPN SILICON PLANAR POWER TRANSISTOR

ZBD857

PROVISIONAL DATASHEET ISSUE A – NOVEMBER 94

FEATURES

- Fast switching
- Guaranteed h_{FE} specified up to 2 Amps
- Low collector-emitter saturation voltage



TO126

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	330	V
Collector-Emitter Voltage	V_{CEO}	300	V
Emitter-Base Voltage	V_{EBO}	6	V
Peak Pulse Current	I_{CM}	4	A
Continuous Collector Current	I_C	3	A
Power Dissipation T_{amb}=25°C	P_{tot}	2	W
Power Dissipation at T_{case}=25°C	P_{tot}	25	W
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +200	°C

THERMAL CHARACTERISTICS

PARAMETER	SYMBOL	MAX	UNIT
Thermal Resistance			
Junction To Ambient	$R_{th(j-amb)}$	75	°C/W
Junction To Case	$R_{th(j-case)}$	7	°C/W

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated)

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	330	475		V	I_C=100µA
Collector-Emitter Breakdown Voltag	$V_{(BR)CER}$	330	475		V	I_C=1µA, RB ≤1KΩ
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	300	350		V	I_C=10mA*
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	6	8		V	I_E=100µA
Collector Cut-Off Current	I_{CBO}			50	nA	V_{CB}=300V
				1	µA	V_{CB}=300V, T_{amb}=100°C
Collector Cut-Off Current	I_{CER} R ≤1KΩ			50	nA	V_{CB}=300V
				1	µA	V_{CB}=300V, T_{amb}=100°C
Emitter Cut-Off Current	I_{EBO}			10	nA	V_{EB}=6V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$			100	mV	I_C=0.5A, I_B=50mA
				140	mV	I_C=1A, I_B=100mA
				200	mV	I_C=2A, I_B=200mA*
				310	mV	I_C=3A, I_B=600mA*
Base-Emitter Saturation Voltage	$V_{BE(sat)}$		900	1100	mV	I_C=2A, I_B=200mA*
Base-Emitter Turn-On Voltage	$V_{BE(on)}$		860	1000	mV	I_C=2A, V_{CE}=5V*
Static Forward Current Transfer Ratio	h_{FE}	100	200			I_C=10mA, V_{CE}=10V
		100	200	300		I_C=500mA, V_{CE}=10V*
		15	25			I_C=2A, V_{CE}=10V*
			15			I_C=3A, V_{CE}=10V*
Transition Frequency	f_T		80		MHz	I_C=100mA, V_{CE}=10V f=100MHz
Output Capacitance	C_{obo}		11		pF	V_{CB}=20V, f=1MHz
Switching Times	t_{on}		100		ns	I_C=250mA, I_{B1}=25mA I_{B2}=25mA, V_{CC}=50V
	t_{off}		5300		ns	

*Measured under pulsed conditions. Pulse width=300µs. Duty cycle ≤2%

PNP LOW DROPOUT REGULATOR TRANSISTOR

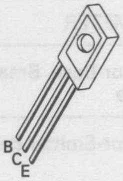
ZBD949

ISSUE 3 – NOVEMBER 1994

FEATURES

- * Guaranteed h_{FE} specified up to 5 Amps
- * Low collector-emitter saturation voltage
  - – 0.11V Maximum at 1A
  - – 0.45V Maximum at 5A

The high gain and very low saturation voltage produce a more effective solution than monolithic options

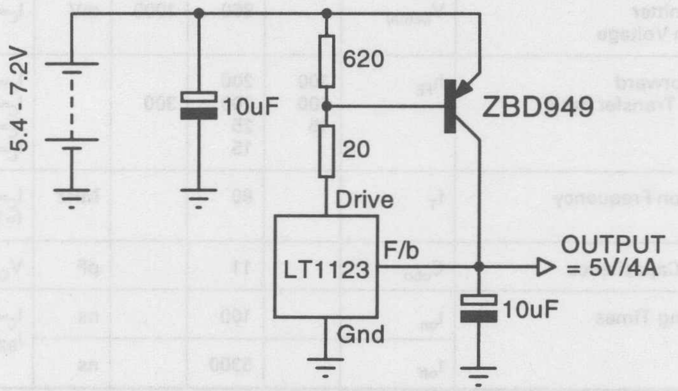


TO126

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	-50	V
Collector-Emitter Voltage	V_{CEO}	-30	V
Emitter-Base Voltage	V_{EBO}	-6	V
Peak Pulse Current	I_{CM}	-20	A
Continuous Collector Current	I_C	-5	A
Power Dissipation at T_{amb}=25°C	P_{tot}	2	W
Power Dissipation at T_{case}=25°C	P_{tot}	25	W
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +200	°C

TYPICAL APPLICATION



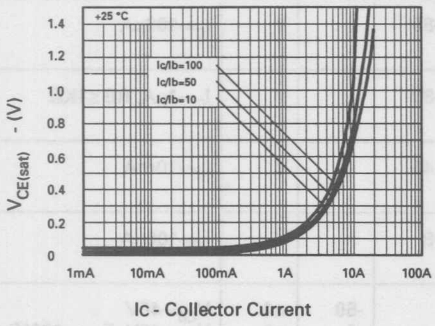
5V Low Dropout Regulator

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated)

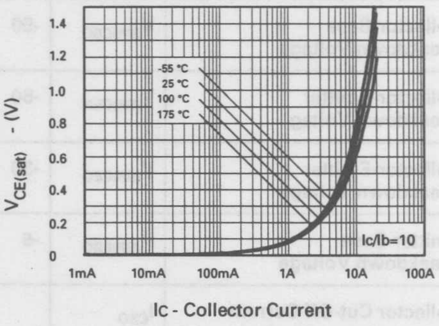
PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	-50	-80		V	I_C=-100µA
Collector-Emitter Breakdown Voltag	$V_{(BR)CER}$	-50	-80		V	I_C=-1µA, RB ≤1KΩ
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	-30	-45		V	I_C=-10mA
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	-6	-8		V	I_E=-100µA
Collector Cut-Off Current	I_{CBO}			-50 -1	nA µA	V_{CB}=-40V V_{CB}=-40V, T_{amb}=100°C
Collector Cut-Off Current	I_{CER} R ≤1KΩ			-50 -1	nA µA	V_{CB}=-40V V_{CB}=-40V, T_{amb}=100°C
Emitter Cut-Off Current	I_{EBO}			-10	nA	V_{EB}=-6V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$			-60 -110 -170 -450	mV mV mV mV	I_C=-0.5A, I_B=-20mA* I_C=-1A, I_B=-20mA* I_C=-2A, I_B=-200mA* I_C=-5A, I_B=-300mA*
Base-Emitter Saturation Voltage	$V_{BE(sat)}$		-1000	-1150	mV	I_C=-5A, I_B=-300mA*
Base-Emitter Turn-On Voltage	$V_{BE(on)}$		-950	-1100	mV	I_C=-5A, V_{CE}=-1V*
Static Forward Current Transfer Ratio	h_{FE}	100 100 75	200 200 140 35	350 300 300		I_C=-10mA, V_{CE}=-1V* I_C=-1A, V_{CE}=-1V* I_C=-5A, V_{CE}=-1V* I_C=-20A, V_{CE}=-1V*
Transition Frequency	f_T		100		MHz	I_C=-100mA, V_{CE}=-10V f=50MHz

*Measured under pulsed conditions. Pulse width=300µs. Duty cycle ≤2%

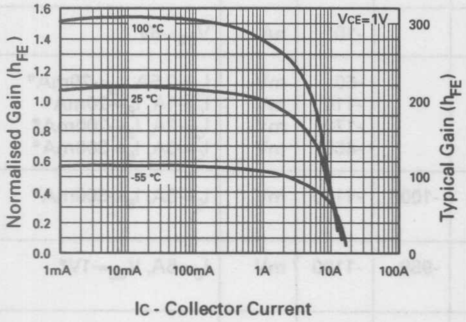
TYPICAL CHARACTERISTICS



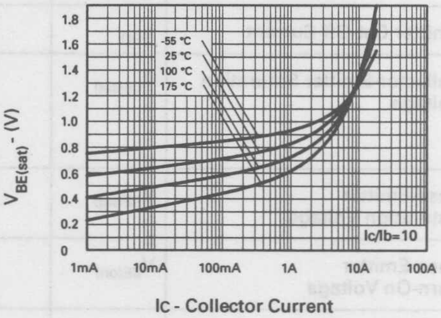
$V_{CE(sat)}$ v I_C



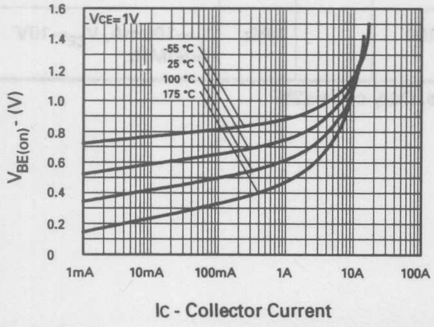
$V_{CE(sat)}$ v I_C



h_{FE} v I_C

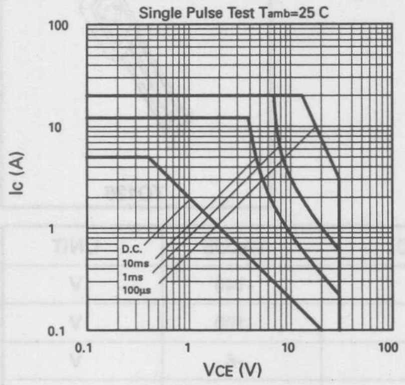


$V_{BE(sat)}$ v I_C

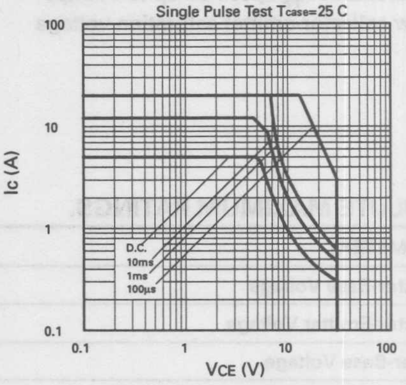


$V_{BE(on)}$ v I_C

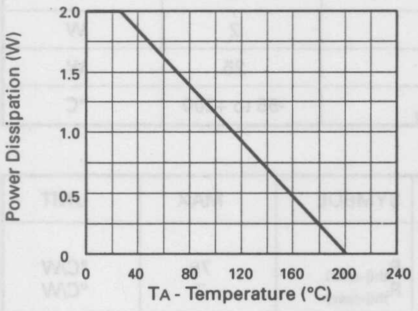
TYPICAL CHARACTERISTICS



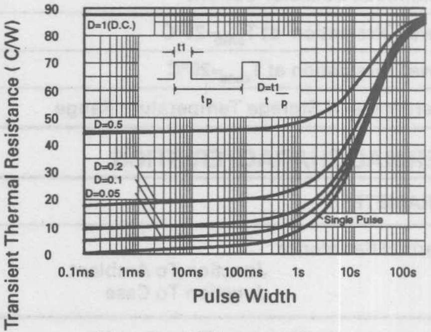
Safe Operating Area



Safe Operating Area



Derating Curve



Transient Thermal Resistance
(Junction To Ambient)

THERMAL CHARACTERISTICS

PARAMETER	SYMBOL	MAX	UNIT
Thermal resistance Junction to ambient Junction to case	$R_{th(j-amb)}$ $R_{th(j-case)}$	87.5 7	°C/W °C/W

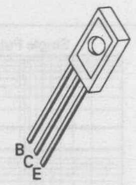
PNP SILICON PLANAR POWER TRANSISTOR

ZBD953

PROVISIONAL DATASHEET ISSUE A – NOVEMBER 94

FEATURES

- Fast switching
- Guaranteed h_{FE} specified up to 4 Amps
- Low collector-emitter saturation voltage



TO126

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	-140	V
Collector-Emitter Voltage	V_{CEO}	-100	V
Emitter-Base Voltage	V_{EBO}	-6	V
Peak Pulse Current	I_{CM}	-10	A
Continuous Collector Current	I_C	-4	A
Power Dissipation at T_{amb}=25°C	P_{totp}	2	W
Power Dissipation at T_{case}=25°C	P_{tot}	25	W
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +200	°C

THERMAL CHARACTERISTICS

PARAMETER	SYMBOL	MAX	UNIT
Thermal Resistance			
Junction To Ambient	$R_{th(j\text{-}amb)}$	75	°C/W
Junction To Case	$R_{th(j\text{-}case)}$	7	°C/W

ZBD953

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated)

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	-140	-170		V	I_C=-100μA
Collector-Emitter Breakdown Voltag	$V_{(BR)CER}$	-140	-170		V	I_C=-1μA, RB ≤1KΩ
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	-100	-120		V	I_C=-10mA
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	-6	-8		V	I_E=-100μA
Collector Cut-Off Current	I_{CBO}			-50	nA	V_{CB}=-100V
				-1	μA	V_{CB}=-100V, T_{amb}=100°C
Collector Cut-Off Current	I_{CER}			-50	nA	V_{CB}=-100V
	R ≤1KΩ			-1	μA	V_{CB}=-100V, T_{amb}=100°C
Emitter Cut-Off Current	I_{EBO}			-10	nA	V_{EB}=-6V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$			-50	mV	I_C=-100mA, I_B=-10mA
				-100	mV	I_C=-1A, I_B=-100mA*
				-160	mV	I_C=-2A, I_B=-200mA*
				-470	mV	I_C=-4A, I_B=-400mA*
Base-Emitter Saturation Voltage	$V_{BE(sat)}$		-1000	-1150	mV	I_C=-4A, I_B=-400mA
Base-Emitter Turn-On Voltage	$V_{BE(on)}$		-950	-1200	mV	I_C=-4A, V_{CE}=-1V*
Static Forward Current Transfer Ratio	h_{FE}	100	200			I_C=-10mA, V_{CE}=-1V*
		100	200	300		I_C=-1A, V_{CE}=-1V*
		50	90			I_C=-3A, V_{CE}=-1V*
		30	50			I_C=-4A, V_{CE}=-1V*
			15			I_C=-10A, V_{CE}=-1V*
Transition Frequency	f_T		125		MHz	I_C=-100mA, V_{CE}=-10V f=50MHz
Output Capacitance	C_{obo}		65		pF	V_{CB}=-10V, f=1MHz
Switching Times	t_{on}		119		ns	I_C=-2A, I_{B1}=-200mA
	t_{off}		460			I_{B2}=200mA, V_{CC}=-10V

*Measured under pulsed conditions. Pulse width=300μs. Duty cycle ≤2%

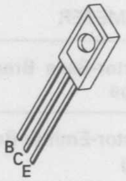
PNP SILICON PLANAR
POWER TRANSISTOR

PROVISIONAL DATASHEET ISSUE A – NOVEMBER 94

ZBD957

FEATURES

- Fast switching
- Guaranteed h_{FE} specified up to 1 Amp
- Low collector-emitter saturation voltage



TO126

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	-330	V
Collector-Emitter Voltage	V_{CEO}	-300	V
Emitter-Base Voltage	V_{EBO}	-6	V
Peak Pulse Current	I_{CM}	-2	A
Continuous Collector Current	I_C	-1	A
Power Dissipation at T_{amb}=25°C	P_{tot}	2	W
Power Dissipation at T_{case}=25°C	P_{tot}	25	W
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +200	°C

THERMAL CHARACTERISTICS (at T_{amb} = 25°C)

PARAMETER	SYMBOL	MAX	UNIT
Thermal Resistance Junction To Ambient Junction To Case	 $R_{th(j-amb)}$ $R_{th(j-case)}$	 75 7	 °C/W °C/W

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated)

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	-330	-440		V	I_C=-100µA
Collector-Emitter Breakdown Voltag	$V_{(BR)CER}$	-330	-440		V	I_C=-1µA, RB ≤1KΩ
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	-300	-400		V	I_C=-10mA
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	-6	-8		V	I_E=-100µA
Collector Cut-Off Current	I_{CBO}			-50 -1	nA µA	V_{CB}=-300V V_{CB}=-300V, T_{amb}=100°C
Collector Cut-Off Current	I_{CER} R ≤1KΩ			-50 -1	nA µA	V_{CB}=-300V V_{CB}=-300V, T_{amb}=100°C
Emitter Cut-Off Current	I_{EBO}			-10	nA	V_{EB}=-6V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$			-100 -150 -290	mV mV mV	I_C=-100mA, I_B=-10mA I_C=-500mA, I_B=-100mA* I_C=-1A, I_B=-300mA*
Base-Emitter Saturation Voltage	$V_{BE(sat)}$		-920	-1100	mV	I_C=-1A, I_B=-300mA*
Base-Emitter Turn-On Voltage	$V_{BE(on)}$		-780	-950	mV	I_C=-1A, V_{CE}=-10V*
Static Forward Current Transfer Ratio	h_{FE}	100 100 90	200 200 170 10	 300		I_C=-10mA, V_{CE}=-10V* I_C=-0.5A, V_{CE}=-10V* I_C=-1A, V_{CE}=-10V* I_C=-2A, V_{CE}=-10V*
Transition Frequency	f_T		85		MHz	I_C=-100mA, V_{CE}=-10V f=50MHz
Output Capacitance	C_{obo}		23		pF	V_{CB}=-20V, f=1MHz
Switching Times	t_{on}		108		ns	I_C=-500mA, I_{B1}=-50mA I_{B2}=50mA, V_{CC}=-100V
	t_{off}		2500		ns	

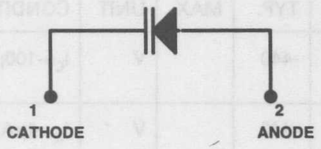
*Measured under pulsed conditions. Pulse width=300µs. Duty cycle ≤2%

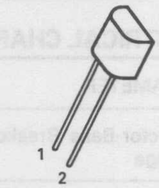
SILICON EPITAXIAL PLANAR ABRUPT TUNER DIODE

ISSUE 2 – SEPTEMBER 94

ZC744

DIODE PIN CONNECTION





E-Line
TO92 Compatible

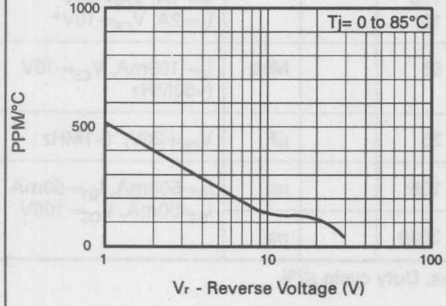
ELECTRICAL CHARACTERISTICS (at T_{amb}=25°C)

PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT	CONDITIONS
Reverse Breakdown Voltage	V_R	30			V	I_R=10μA
Reverse Voltage Leakage	I_R			0.02	μA	V_R=25V
Case Capacitance	C_C		0.15		pF	
Temperature Coefficient of capacitance	η		0.02		%/°C	V_R=3V

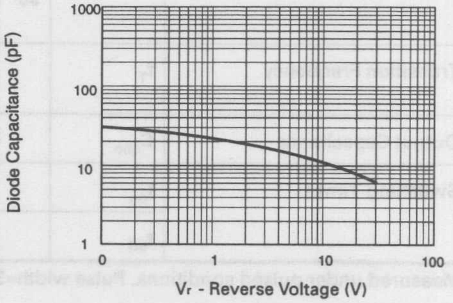
TUNING CHARACTERISTICS (at T_{amb}=25°C)

PART NO.	C_T at V_R=4V, f=1MHz pF			Capacitance Ratio C_2/C_{30} at f=1MHz	Minimum Q at V_R=4V f=50MHz
	MIN	TYP	MAX		
ZC744	13.5	15.0	16.5	2.8	400

TYPICAL CHARACTERISTICS



Temperature Coefficient of Capacitance v Vr



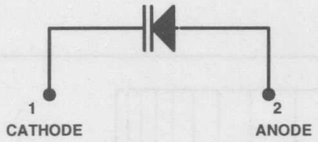
Capacitance v Vr

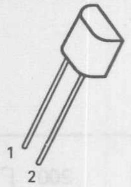
SILICON ION-IMPLANTED HYPERABRUPT TUNER DIODES

ISSUE 2 – MARCH 94

ZC820 SERIES

DIODE PIN CONNECTION





E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	MAX	UNIT
Reverse Voltage	V_R	25	V
Forward Current	I_F	200	mA
Power Dissipation at T_{amb}=25°C	P_{tot}	300	mW
Junction Temperature	T_j	125	°C
Storage Temperature Range	T_{stg}	-55 to +200	°C

ELECTRICAL CHARACTERISTICS (at T_{amb}=25°C)

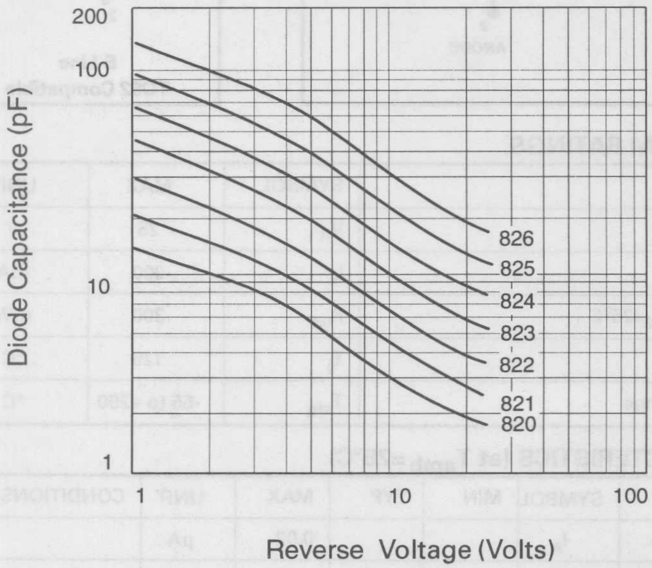
PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT	CONDITIONS
Reverse Voltage Leakage	I_R			0.02	µA	
Temperature Coefficient of Capacitance	η		0.03	0.04	%/°C	V_R=3V

TUNING CHARACTERISTICS (at T_{amb}=25°C)

PART NO	Nominal Capacitance in pF @ V_R=2V, f=1MHz			Minimum Q @ V_R=3V f=50MHz	Capacitance Ratio C_2/C_{20}, at f=1MHz	
	MIN	NOM	MAX		MIN	MAX
ZC820	8	10	12	300	5	6.5
ZC821	12	15	18	300	5	6.5
ZC822	17.6	22	26.4	200	5	6.5
ZC823	26.4	33	39.6	200	5	6.5
ZC824	37.6	47	56.4	200	5	6.5
ZC825	54.4	68	81.6	100	5	6.5
ZC826	80	100	120	100	5	6.5

*Available with 2V nominal capacitance ±10 suffix A, ± 5% suffix B

ZC820 SERIES



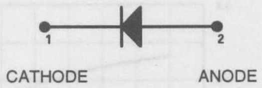
Diode Capacitance

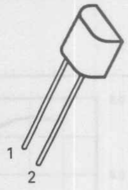
SCHOTTKY BARRIER DIODES

ZC2800
ZC2811
ZC5800

ISSUE 2 – MARCH 94

DIODE PIN CONNECTION





E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

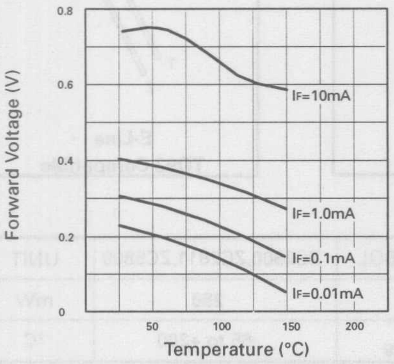
PARAMETER	SYMBOL	ZC2800,ZC2811,ZC5800	UNIT
Power Dissipation at $T_{amb}=25°C$	P_{tot}	250	mW
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +200	°C

ELECTRICAL CHARACTERISTICS (at $T_{amb}=25°C$).

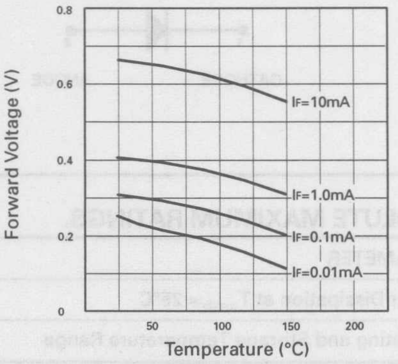
PARAMETER	TYPE	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Breakdown Voltage	ZC2800 ZC2811 ZC5800	V_{BR}	70 15 50			V V V	$I_R=10\mu A$
Reverse Leakage Current	ZC2800 ZC2811 ZC5800	I_R			200 100 200	nA nA nA	$V_R=50V$ $V_R=10V$ $V_R=35V$
Forward Voltage	ZC2800 ZC2811 ZC5800	V_F			410 410 410	mV mV mV	$I_F=1mA$
Forward Current	ZC2800 ZC2811 ZC5800	I_F	15 20 15			mA mA mA	$V_F=1V$
Capacitance	ZC2800 ZC2811 ZC5800	C_T			2.0 1.2 2.0	pF pF pF	$V_R=0$ V, f=1MHz
Effective Minority Lifetime (1)	ZC2800 ZC2811 ZC5800	τ			100 100 100	ps ps ps	f= 54 MHz $I_{pk}=20mA$

(1) Sample Test.

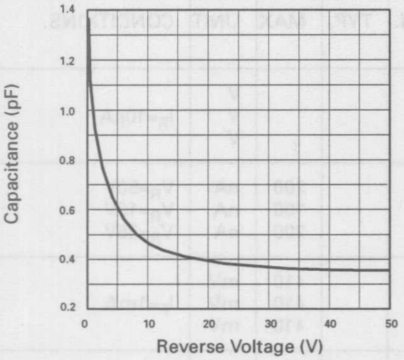
TYPICAL CHARACTERISTICS



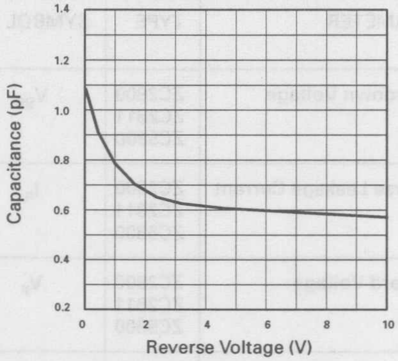
(ZC2800 & ZC5800)



(ZC2811)

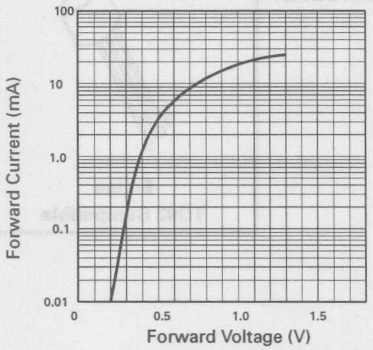


(ZC2800 & ZC5800)

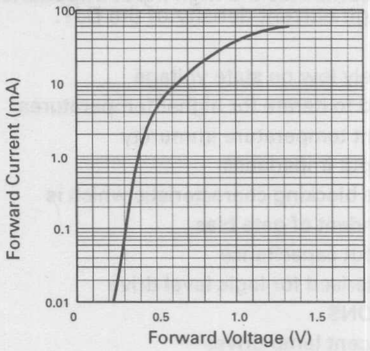


(ZC2811)

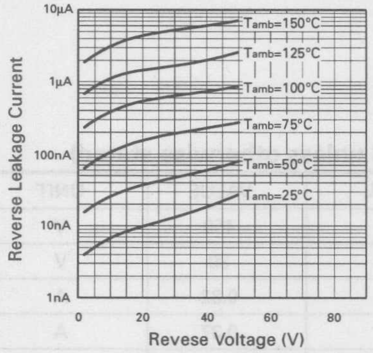
TYPICAL CHARACTERISTICS



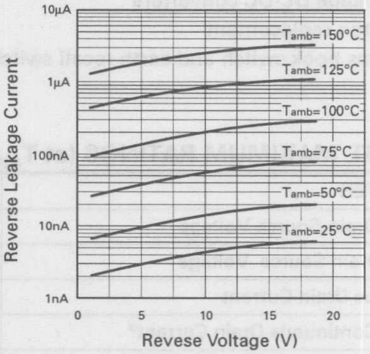
(ZC2800 & ZC5800)



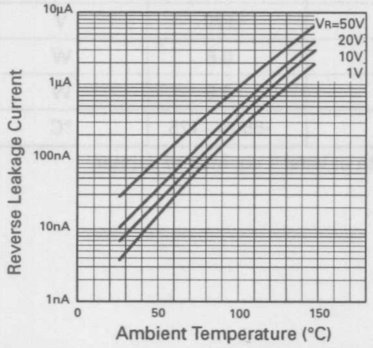
(ZC2811)



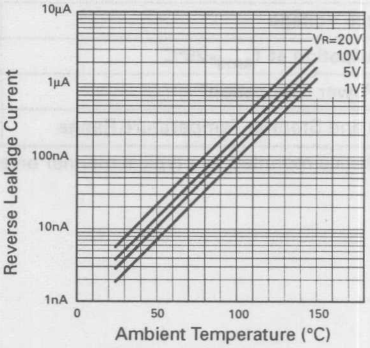
(ZC2800 & ZC5800)



(ZC2811)



(ZC2800 & ZC5800)

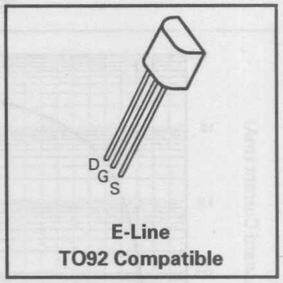


(ZC2811)

N-CHANNEL ENHANCEMENT MODE VERTICAL IGBT

ISSUE 2 – MAY 94

ZCN0545A



This IGBT combines the high input impedance of the DMOSFET with the high current density of the BJT.

FEATURES

- Extremely low on state voltage
- No need to derate for higher temperatures
- Excellent temperature immunity
- High input impedance
- Reverse blocking characteristic which is Independent of gate bias
- Low input capacitance
- Characterised for logic level drive

APPLICATIONS

- Fluorescent lamp driver
- Automotive load drivers
- High voltage DC-DC converters
- Darlington replacement
- Telecoms hook switch and earth recall switch

ABSOLUTE MAXIMUM RATINGS (at T_{amb}=25°C unless otherwise stated)

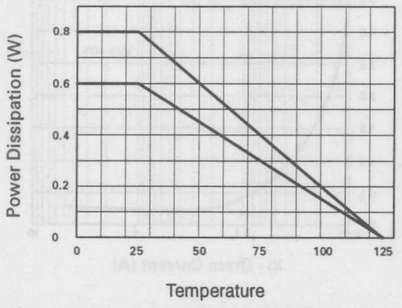
PARAMETER	SYMBOL	VALUE	UNIT
Forward Drain-Source Voltage	V_{DS}	450	V
Reverse Drain Source Voltage	V_{SD}	30	V
Continuous Drain Current	I_D	0.32	A
Practical Continuous Drain Current*	I_{DP}	0.37	A
Pulsed Drain Current @ T_{amb}=25°C @ T_{amb}=125°C	I_{DMR} I_{DM}	2 1	A A
Gate-Source Voltage	V_{GS}	±20	V
Power Dissipation at T_{amb}=25°C	P_{tot}	0.6	W
Practical Power Dissipation*	P_{DP}	0.8	W
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +125	°C

* With the device mounted in a typical manner on a P.C.B. with at least 1 sq. inch of copper.

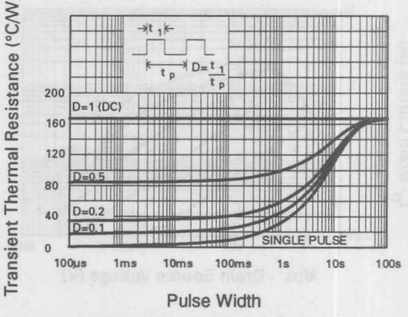
ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Forward Drain-Source Breakdown Voltage	BV_{DSS}	450			V	V_{GS}=0V
Reverse Drain-Source Breakdown Voltage (4)	BV_{SD}	30			V	I_D=1mA
Gate-Source Threshold Voltage	$V_{GS(th)}$	1		3	V	I_D=1mA, V_{DS}= V_{GS}
Gate-Body Leakage	I_{GSS}			20	nA	V_{GS}=± 20V, V_{DS}=0V
Zero Gate Voltage Drain Current	I_{DSS}			10 400	µA µA	V_{DS}=max. rating, V_{GS}=0 V_{DS}=0.8 x max. rating, V_{GS}=0V, T=125°C (2)
Drain Source Saturation Voltage (1)	$V_{DS(SAT)}$			3 3	V V	I_D=500mA, V_{GS}=10 V I_D=250mA, V_{GS}=5 V
Static Drain-Source On-State Resistance (1)	$R_{DS(on)}$			6	Ω	V_{GS}=10V,I_D=0.5A
Input Capacitance (2)	C_{iss}			90	pF	
Common Source Output Capacitance (2)	C_{oss}			12	pF	V_{DS}=25 V, V_{GS}=0V, f=1MHz
Reverse Transfer Capacitance (2)	C_{rss}			6	pF	
Switching Times (2)(3)	t_{on}			150	ns	V_{DD}≈25V, V_{GEN}=10V I_D=1A, R_{GS}=50Ω
	t_{off}		200	300	ns	

(1) Measured under pulsed conditions. Width=300µs. Duty cycle ≤2% (2) Sample test.
(3) Switching times measured with 50Ω source impedance and <5ns rise time on a pulse generator
(4) One minute maximum duration. Exceeds common international automotive reverse battery test specifications



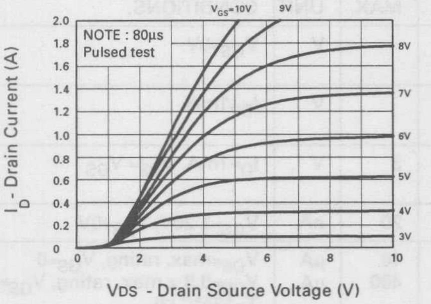
Derating Curve



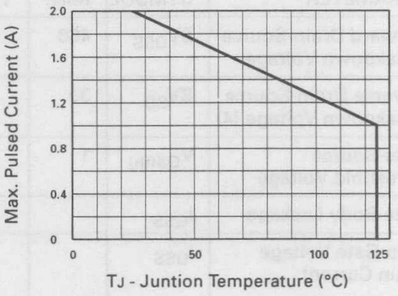
Transient Thermal Resistance

ZCN0545A

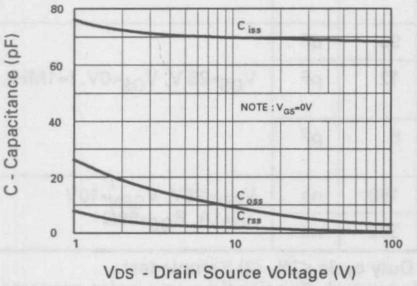
TYPICAL CHARACTERISTICS



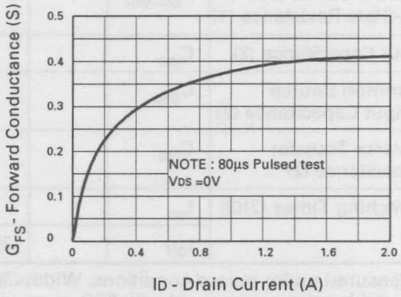
Saturation Characteristics



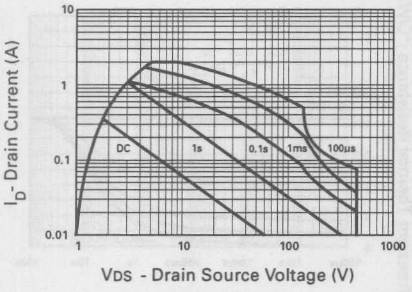
Pulsed Current v Temperature



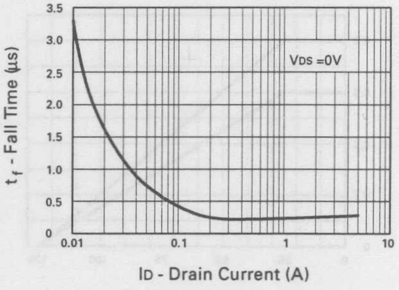
Capacitance v Drain Source Voltage



Transconductance v Drain Current



Safe Operating Area
(Tamb=25°C, single pulse)



Fall Time v Drain Current

N-CHANNEL IGBT
WITH INTEGRAL DIODE

DRAFT DATASHEET ISSUE A– DECEMBER 94

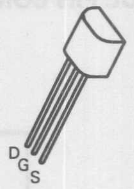
ZCN9150A

FEATURES

- 500 Volt V_{DS}
- Integral Diode
- Fast Switching

APPLICATIONS

- Compact Fluorescent Ballast



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS (at T_{amb}=25°C unless otherwise stated)

PARAMETER	SYMBOL	VALUE	UNIT
Forward Drain-Source Voltage	V_{DS}	500	V
Continuous Drain Current	I_D	0.32	A
Pulsed Drain Current @ T_{amb}=25°C @ T_{amb}=125°C	I_{DMR} I_{DM}	4 2	A A
Gate-Source Voltage	V_{GS}	±20	V
Power Dissipation at T_{amb}=25°C	P_{tot}	0.6	W
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +125	°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Forward Drain-Source Breakdown Voltage	BV_{DSS}	500			V	V_{GS}=0V,I_D=1mA
Gate-Source Voltage	V_{GS}	1		3	V	V_{DG}=25V,I_D=1mA
Zero Gate Voltage Drain Current	I_{DSS}			10	μA	V_{DS}=500V, V_{GS}=0
Gate-Body Leakage	I_{GSS}			20	nA	V_{GS}=± 20V, V_{DS}=0V
Drain Source Saturation Voltage (1)	$V_{DS(sat)}$			3	V	I_D=500mA, V_{GS}=10 V
Static Drain-Source On-State Resistance (1)	$R_{DS(on)}$			6	Ω	V_{GS}=10V,I_D=0.5A

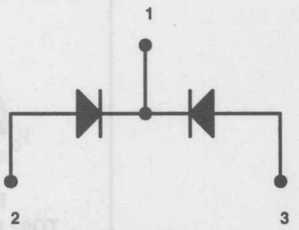
(1) Measured under pulsed conditions. Width=300μs. Duty cycle ≤2%

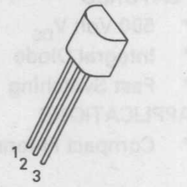
SILICON PLANAR HIGH SPEED SWITCHING COMMON CATHODE DIODE PAIR

ZDX1F
ZDX2F

ISSUE 2 – MARCH 94

DIODE PIN CONNECTION





E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	ZDX1F	ZDX2F	UNIT
Non-Repetitive Peak Reverse Voltage	V_{RSM}	20	50	V
Repetitive Peak Reverse Voltage	V_{RRM}	15	30	V
Average Rectified Forward Current	$I_{F(AV)}$	250		mA
Non-Repetitive Peak Forward Current (t=1µs)	I_{FSM}	1.5		A
Power Dissipation at T_{amb} = 25°C	P_{tot}	375		mW
Operating and Storage Temperature Range	T_j:T_{stg}	-65 to +175		°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

PARAMETER	SYMBOL	MIN.	MAX.	UNIT	CONDITIONS.
Reverse Breakdown Voltage ZDX1F ZDX2F	$V_{(BR)R}$	20 50		V	I_R=10µA I_R=10µA
Reverse Current	I_R		1.0 100	µA µA	At rated V_{RRM} At rated V_{RRM} T_{amb}=100°C
Reverse Recovery Time	t_{rr}		3	ns	I_F=10mA, V_R=5V* R_L=50Ω
Forward Recovery Time	t_{fr}		10	ns	I_F=10mA
Forward Overshoot Voltage	V_{fr}		2.5	V	I_F=10mA, Rise time=5ns ±20%
Forward Voltage	V_F		900 1200 1500	mV mV mV	I_F=-10mA I_F=-100mA I_F=-250mA

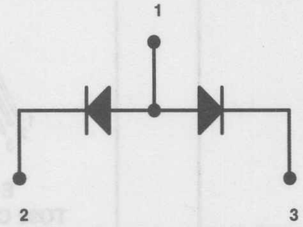
*Time for I_R to recover to 10% of I_R peak

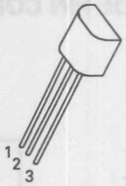
SILICON PLANAR HIGH SPEED SWITCHING COMMON ANODE DIODE PAIR

ZDX1R
ZDX2R

ISSUE 2 – MARCH 94

DIODE PIN CONNECTION





E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	ZDX1R	ZDX2R	UNIT
Non-Repetitive Peak Reverse Voltage	V_{RSM}	20	50	V
Repetitive Peak Reverse Voltage	V_{RRM}	15	30	V
Average Rectified Forward Current	$I_{F(AV)}$	250		mA
Non-Repetitive Peak Forward Current (t=1µs)	I_{FSM}	1.5		A
Power Dissipation at T_{amb}= 25°C	P_{tot}	375		mW
Operating and Storage Temperature Range	T_j:T_{stg}	-65 to +175		°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

PARAMETER	SYMBOL	MIN.	MAX.	UNIT	CONDITIONS.
Reverse Breakdown Voltage ZDX1R ZDX2R	$V_{(BR)R}$	20 50		V	I_R=10µA I_R=10µA
Reverse Current	I_R		1.0 100	µA µA	At rated V_{RRM} At rated V_{RRM} T_{amb}=100°C
Reverse Recovery Time	t_{rr}		4	ns	I_F=10mA, V_R=5V* R_L=50Ω
Forward Recovery Time	t_{fr}		10	ns	I_F=10mA
Forward Overshoot Voltage	V_{fr}		2.5	V	I_F=10mA, Rise time=5ns ±20%
Forward Voltage	V_F		900 1200 1500	mV mV mV	I_F=-10mA I_F=-100mA I_F=-250mA

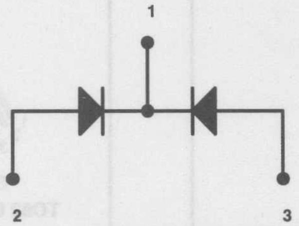
*Time for I_R to recover to 10% of I_R peak

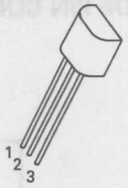
SILICON PLANAR LOW LEAKAGE COMMON CATHODE DIODE PAIR

ZDX3F
ZDX4F

ISSUE 2 – MARCH 94

DIODE PIN CONNECTION





E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	ZDX3F	ZDX4F	UNIT
Repetitive Peak Reverse Voltage	V_{RRM}	50	100	V
Average Rectified Forward Current	$I_{F(AV)}$	250		mA
Non-Repetitive Peak Forward Current (t=1µs)	I_{FSM}	3.0		A
Power Dissipation at T_{amb} = 25°C	P_{tot}	375		mW
Operating and Storage Temperature Range	T_j:T_{stg}	-65 to +175		°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

PARAMETER	SYMBOL	MIN.	MAX.	UNIT	CONDITIONS.
Reverse Current	I_R		5 5	nA µA	At rated V_{RRM} At rated V_{RRM} T_{amb}=150°C
Reverse Recovery Time*	t_{rr}		400	ns	I_F= I_R=50 – 400mA
Forward Recovery Time	t_{fr}		10	ns	I_F=10mA
Diode Capacitance	C_d		4	pF	V_R=1V, f=1MHz
Forward Overshoot Voltage	V_{fr}		Typ 0.9	V	I_F=10mA, Rise time=5ns ±20%
Forward Voltage	V_F		1.4	V	I_F=-200mA

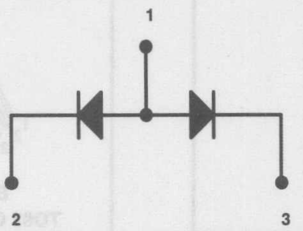
*Time for I_R to recover to 10% of I_R peak

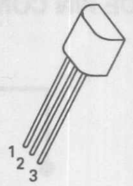
SILICON PLANAR LOW LEAKAGE COMMON ANODE DIODE PAIR

ZDX3R
ZDX4R

ISSUE 2 – MARCH 94

DIODE PIN CONNECTION





E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	ZDX3R	ZDX4R	UNIT
Repetitive Peak Reverse Voltage	V_{RRM}	50	30	V
Average Rectified Forward Current	$I_{F(AV)}$	250		mA
Non-Repetitive Peak Forward Current (t=1µs)	I_{FSM}	3.0		A
Power Dissipation at T_{amb}= 25°C	P_{tot}	375		mW
Operating and Storage Temperature Range	T_j:T_{stg}	-65 to +175		°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

PARAMETER	SYMBOL	MIN.	MAX.	UNIT	CONDITIONS.
Reverse Current	I_R		5 5	nA µA	At rated V_{RRM} At rated V_{RRM}, T_{amb}=150°C
Reverse Recovery Time*	t_{rr}		400	ns	I_F= I_R=50 – 400mA
Forward Recovery Time	t_{fr}		10	ns	I_F=10mA
Diode Capacitance	C_d		4	pF	V_R=1V, f=1MHz
Forward Overshoot Voltage	V_{fr}		Typ 0.9	V	I_F=10mA, Rise time=5ns ±20%
Forward Voltage	V_F		1.4	V	I_F=-200mA

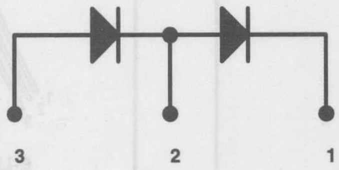
*Time for I_R to recover to 10% of I_R peak

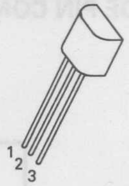
SILICON PLANAR HIGH SPEED SWITCHING SERIES DIODE PAIR

ISSUE 2 – MARCH 94

ZDX5
ZDX6

DIODE PIN CONNECTION





E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	ZDX5	ZDX6	UNIT
Repetitive Peak Reverse Voltage	V_{RRM}	30	70	V
Average Rectified Forward Current	$I_{F(AV)}$	250		mA
Non-Repetitive Peak Forward Current (t=1μs)	I_{FSM}	1.5		A
Power Dissipation at T_{amb} = 25°C	P_{tot}	375		mW
Operating and Storage Temperature Range	T_j:T_{stg}	-65 to +175		°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C).

PARAMETER	SYMBOL	MIN.	MAX.	UNIT	CONDITIONS.
Reverse Current	I_R		1	μA	At rated V_{RRM}
Reverse Recovery Time*	t_{rr}		6	ns	Switched from I_F= 10mA to V_R=1V R_L=100Ω, I_R=1mA
Diode Capacitance	C_d		1.5	pF	V_R=0, f=1MHz
Forward Overshoot Voltage	V_{fr}		2.5	V	I_F=10mA, Rise time=5ns ±20%
Forward Voltage	V_F		715 855 1100 1300	mV mV mV mV	I_F=1mA I_F=10mA I_F=50mA I_F=100mA

*Time for I_R to recover to 10% of I_R peak

ADJUSTABLE PRECISION ZENER SHUNT REGULATOR

ZR431C

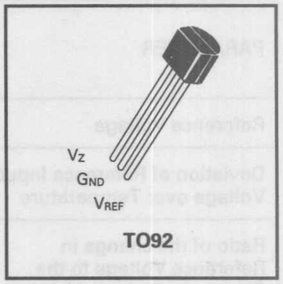
ISSUE 1 – FEB 94

FEATURES

- Average temperature coefficient 50 ppm/°C
- Temperature compensated for operation over the full temperature range
- Programmable output voltage
- 50µA to 100mA current sink capability
- Low output noise

APPLICATIONS

- Shunt regulator
- Series regulator
- Voltage monitor
- Over voltage/ under voltage protection
- Switch mode power supplies



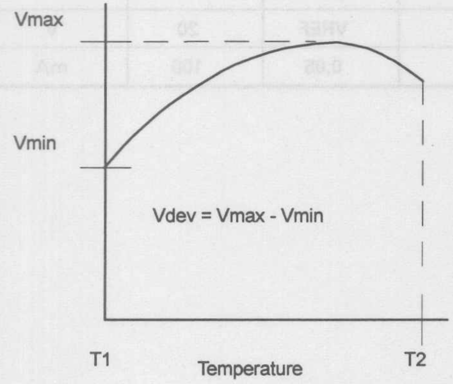
ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	VALUE	UNIT
Cathode Voltage	V_Z	20	V
Cathode Current	I_K	150	mA
Power Dissipation at T_{amb}=25°C	P_{tot}	780	mW
Operating Temperature	T_j	-40 to +85	°C

RECOMMENDED OPERATING CONDITIONS

PARAMETER	SYMBOL	VALUE		UNIT
		MIN	MAX	
Cathode Voltage	V_Z	VREF	20	V
Cathode Current	I_K	0.05	100	mA

PARAMETER	SYMBOL	VALUE			UNITS	CONDITIONS
		MIN	TYP	MAX		
Reference Voltage	V_{REF}	2.45	2.50	2.55	V	$V_Z=V_{REF}$, I_L=10mA (Fig1)
Deviation of Reference Input Voltage over Temperature	V_{dev}		8.0	17	mV	$V_Z=V_{REF}$, I_L=10mA T_a=full range (Fig1)
Ratio of the change in Reference Voltage to the Change in Cathode Voltage	$\frac{\Delta V_{ref}}{\Delta V_Z}$		-1.85	-2.7	mV/V	V_Z from V_{REF} to 10V I_Z=10mA (Fig2)
			-1.0	-2.0	mV/V	V_Z from 10V to 20V I_Z=10mA (Fig2)
Reference Input Current	I_{REF}		0.12	1.0	µA	R1=10K, R2=O/C, I_L=10mA (Fig2)
Deviation of Reference Input Current over Temperature	ΔI_{REF}		0.04	0.2	µA	R1=10K, R2=O/C, I_L=10mA T_a=full range (Fig2)
Minimum Cathode Current for Regulation	I_{Zmin}		35	50	µA	$V_Z=V_{REF}$ (Fig1)
Off-state Current	I_{Zoff}			0.1	µA	V_Z=20V, V_{REF}=0V (Fig3)
Dynamic Output Impedance	R_Z			0.75	Ω	$V_Z=V_{REF}$ (Fig1), f=0Hz



Deviation of reference input voltage, V_{dev}, is defined as the maximum variation of the reference input voltage over the full temperature range.

The average temperature coefficient of the reference input voltage, V_{REF} is defined as:

$$V_{REF}\,(ppm/^\circ C)=\frac{V_{dev}\times 1000000}{V_{ref}\,(T1-T2)}$$

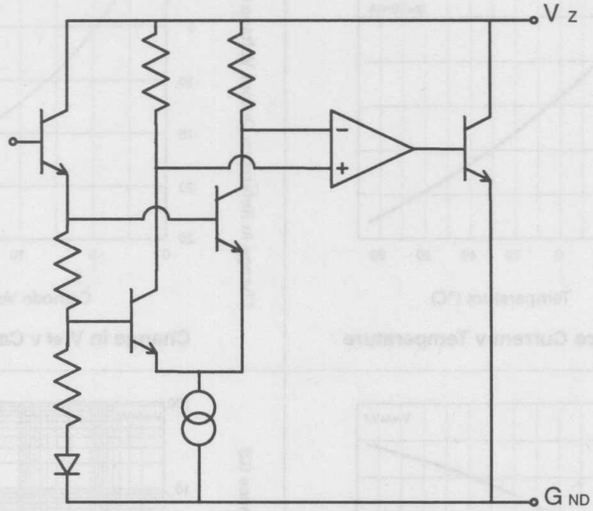
The dynamic output impedance, Rz, is defined as:

$$R_Z=\frac{\Delta V_Z}{\Delta I_Z}$$

When the device is programmed with two external resistors, R1 and R2, (fig 2) ,the dynamic output impedance of the overall circuit, R′, is defined as:

$$R'=R_Z\,(1+\frac{R1}{R2})$$

SCHEMATIC DIAGRAM



DC TEST CIRCUITS

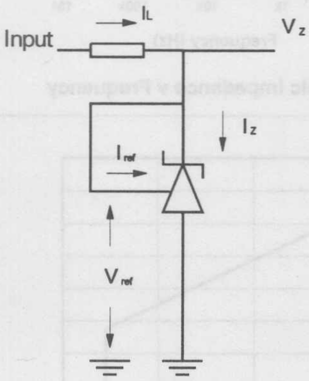


Fig 1 – Test Circuit for $V_z=V_{REF}$

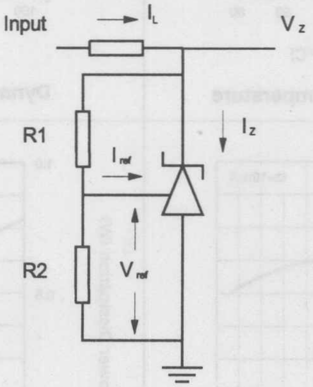


Fig 2 – Test Circuit for $V_z>V_{REF}$

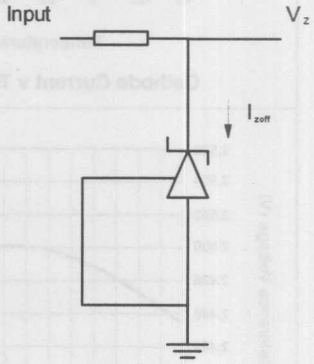
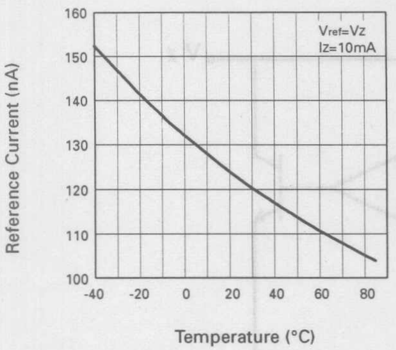
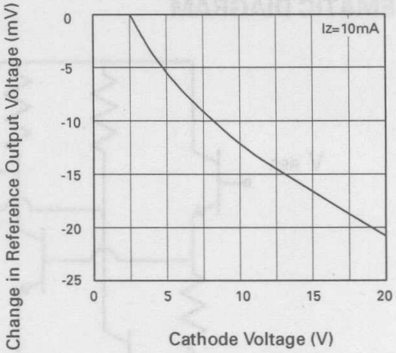


Fig 3 – Test Circuit for Off State current

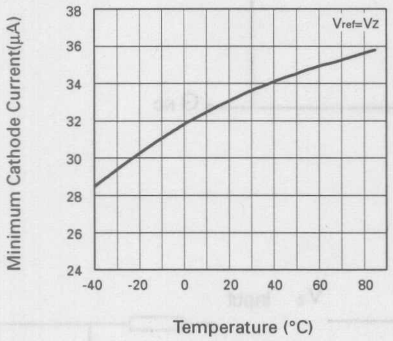
TYPICAL CHARACTERISTICS



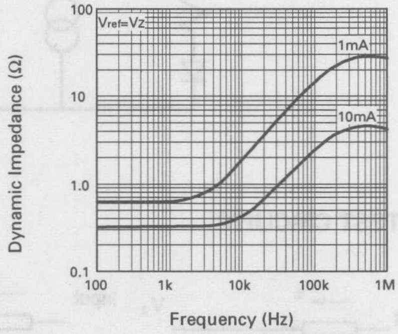
Reference Current v Temperature



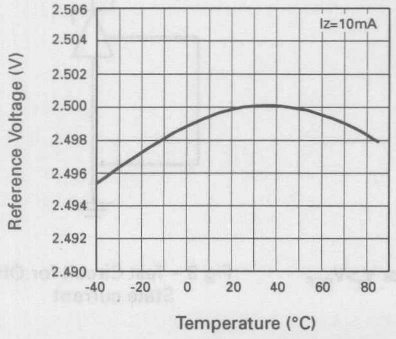
Change in V_{ref} v Cathode Voltage



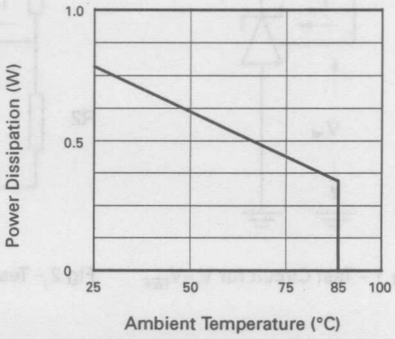
Cathode Current v Temperature



Dynamic Impedance v Frequency

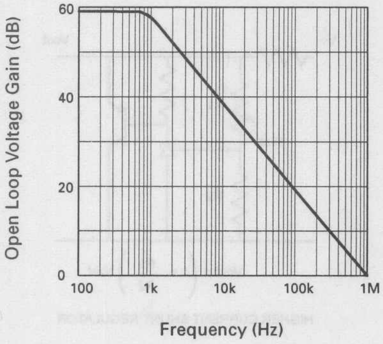


Reference Voltage v Temperature

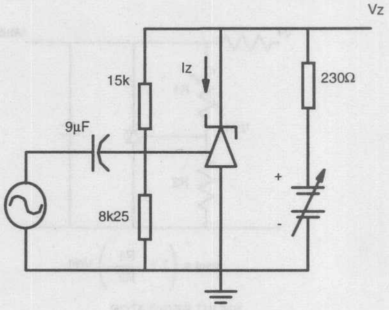


Power Dissipation Derating

TYPICAL CHARACTERISTICS

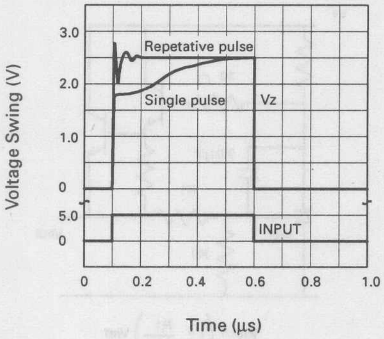


Gain v Frequency

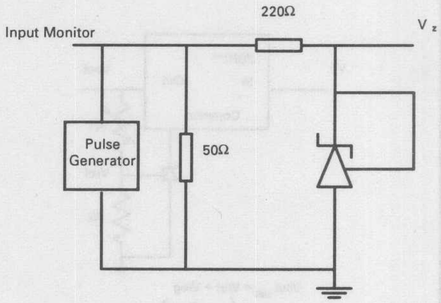


Iz = 10mA, TA = 25 C

Test Circuit for Open Loop Voltage Gain

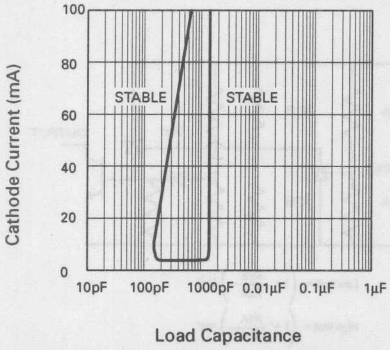


Pulse Response

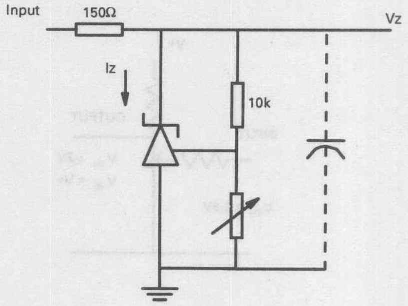


TA = 25 C

Test Circuit for Pulse Response



Stability Boundary Conditions

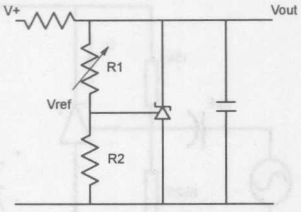


Vref < Vz < 20, Iz = 10mA, TA = 25°C

Test Circuit for Stability Boundary Conditions

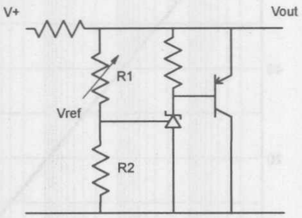
ZR431C

APPLICATION CIRCUITS



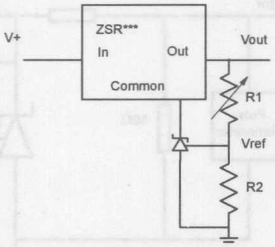
$$V_{out} = \left(1 + \frac{R1}{R2}\right) V_{ref}$$

SHUNT REGULATOR



$$V_{out} = \left(1 + \frac{R1}{R2}\right) V_{ref}$$

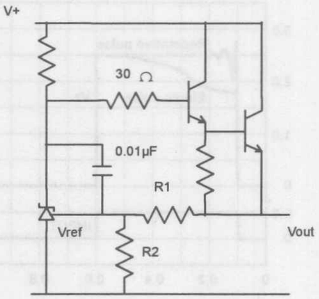
HIGHER CURRENT SHUNT REGULATOR



$$V_{out\,MIN} = V_{ref} + V_{reg}$$

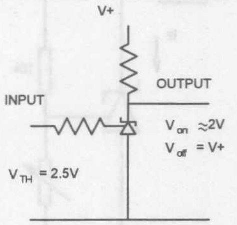
$$V_{out} = \left(1 + \frac{R1}{R2}\right) V_{ref}$$

OUTPUT CONTROL OF A
THREE TERMINAL FIXED REGULATOR

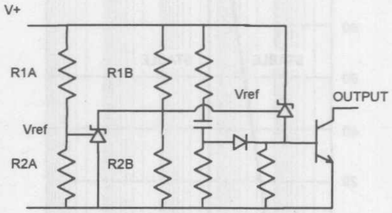


$$V_{out} = \left(1 + \frac{R1}{R2}\right) V_{ref}$$

SERIES REGULATOR



SINGLE SUPPLY COMPARATOR
WITH TEMPERATURE
COMPENSATED THRESHOLD



$$\text{Low limit} = \left(1 + \frac{R1B}{R2B}\right) V_{ref}$$

$$\text{High limit} = \left(1 + \frac{R1A}{R2A}\right) V_{ref}$$

OVER VOLTAGE / UNDER VOLTAGE
PROTECTION CIRCUIT

PRECISION 1.24 VOLT MICROPOWER VOLTAGE REFERENCE

ZRA124

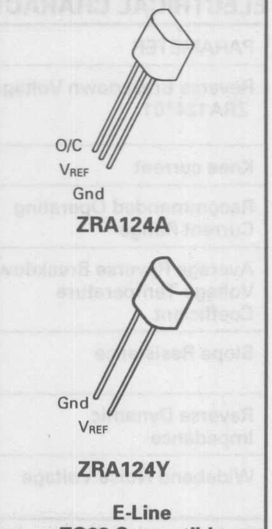
ISSUE 2 – JUNE 94

FEATURES

- No stabilising capacitor required
- Typical T_C 30ppm/°C
- Typical slope resistance 0.65Ω
- ±1% tolerance
- Industrial temperature range
- Operating current 50µA to 5mA
- Transient response, stable in less than 10µs

APPLICATIONS

- Battery powered and portable equipment
- Metering and measurement systems
- Instrumentation
- Test equipment
- Data acquisition systems
- Precision power supplies

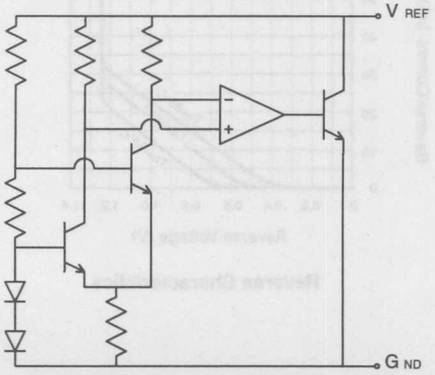


E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Reverse Curent	I_R	25	mA
Forward Current	I_F	25	mA
Power Dissipation at T_{amb}=25°C	P_{tot}	500	mW
Operating Temperature	T_j	-40 to 85	°C
Storage Temperature	T_{stg}	-55 to 125	°C

SCHEMATIC DIAGRAM



ZRA124

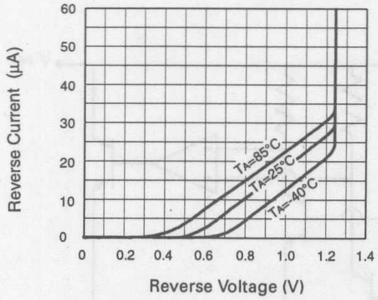
ELECTRICAL CHARACTERISTICS (at T_{amb}=25°C)

PARAMETER	SYMBOL	MIN	TYP.	MAX	UNITS	CONDITIONS
Reverse Breakdown Voltage ZRA124*01	V_{REF}	1.228	1.24	1.252	V	I_{REF}=150µA
Knee current	I_{ON}		30	50	µA	
Recommended Operating Current Range	I_{REF}	0.05		5	mA	
Average Reverse Breakdown Voltage Temperature Coefficient	T_C		30	90	ppm/°C	I_{REF}(min) to I_{REF}(max)
Slope Resistance	R_S		0.65	2	Ω	I_{REF}(min) to I_{REF}(max)
Reverse Dynamic Impedance	Z_R		0.5	1	Ω	I_{REF}=1mA, f=100Hz I_{AC}=0.1 I_{REF}
Wideband Noise Voltage	E_N		70		µV (rms)	I_{REF}=150µA f=10Hz to 10kHz

*Package option A=3 pin device, Y=2 pin device

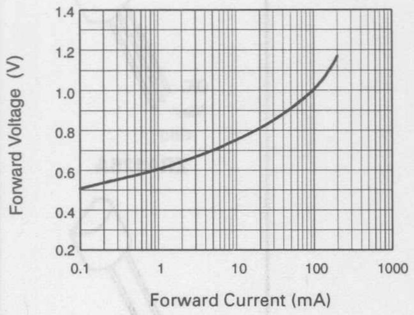
$$T_C = \frac{V_{REF}\ Change\ x\ 1000000}{V_{REF}\ x\ Temperature\ Change}$$

$$R_S = \frac{V_{REF}\ Change\ (I_{REF}\ (min)\ to\ I_{REF}\ (max))}{I_{REF}\ (max) - I_{REF}\ (min)}$$

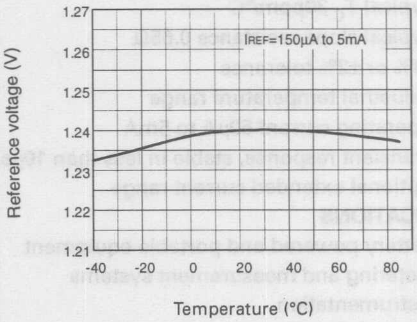


Reverse Characteristics

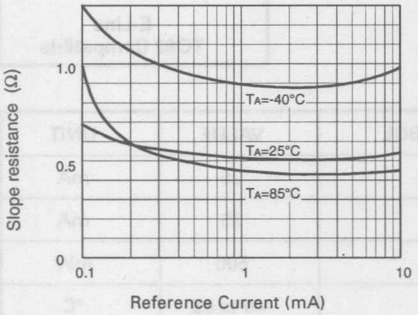
TYPICAL CHARACTERISTICS



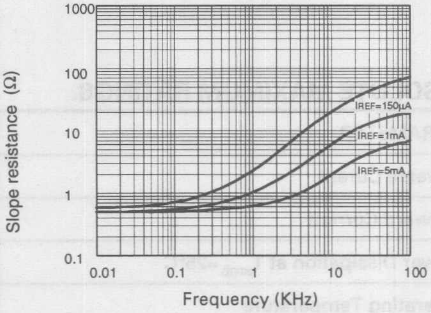
Forward Characteristics



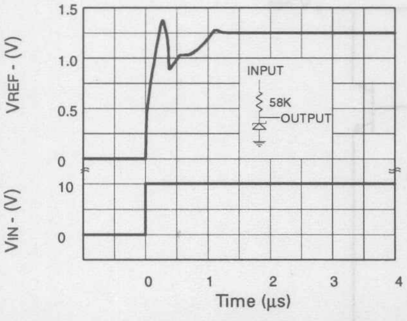
Temperature Drift



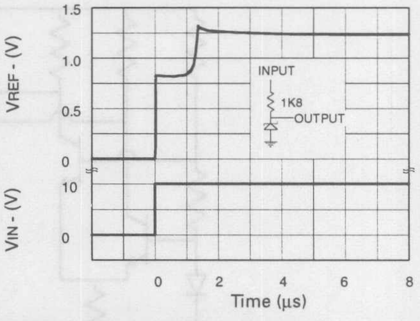
Slope Resistance v Current



Slope Resistance v Frequency



Transient Response (IREF=150µA)



Transient Response (IREF=5mA)

PRECISION 1.25 VOLT MICROPOWER VOLTAGE REFERENCE

ZRA125

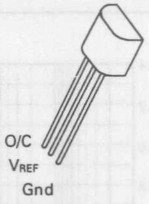
ISSUE 2 – JULY 94

FEATURES

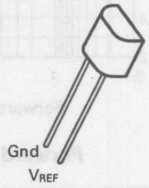
- No stabilising capacitor required
- Typical T_C 30ppm/°C
- Typical slope resistance 0.65Ω
- ±3% or ±2% tolerance
- Industrial temperature range
- Operating current 50µA to 5mA
- Transient response, stable in less than 10µs
- Optional extended current range

APPLICATIONS

- Battery powered and portable equipment
- Metering and measurement systems
- Instrumentation
- Test equipment
- Data acquisition systems
- Precision power supplies



ZRA125A



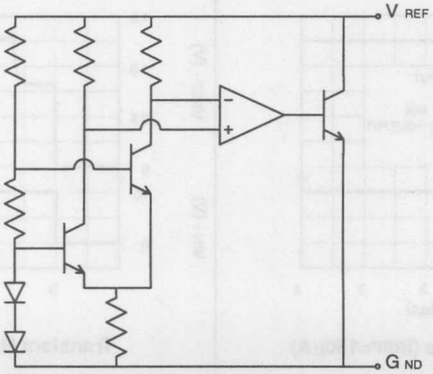
ZRA125Y

E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Reverse Curent	I_R	25	mA
Forward Current	I_F	25	mA
Power Dissipation at T_{amb}=25°C	P_{tot}	500	mW
Operating Temperature	T_j	-40 to 85	°C
Storage Temperature	T_{stg}	-50 to 125	°C

SCHEMATIC DIAGRAM



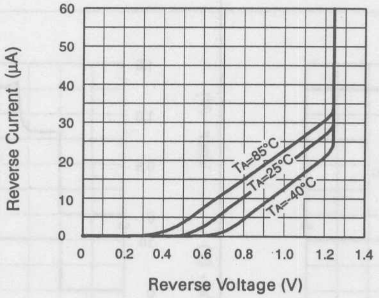
ELECTRICAL CHARACTERISTICS (at T_{amb}=25°C)

PARAMETER	SYMBOL	MIN	TYP.	MAX	UNITS	CONDITIONS
Reverse Breakdown Voltage ZRA125*02 ZRA125*03	V_{REF}	 1.225 1.21	 1.25 1.25	 1.275 1.29	 V V	 I_{REF}=150µA I_{REF}=150µA
Knee current	I_{ON}		30	50	µA	
Recommended Operating Current Range	I_{REF}	0.05		5	mA	
Average Reverse Breakdown Voltage Temperature Coefficient	T_C		30	90	ppm/°C	I_{REF}(min) to I_{REF}(max)
Slope Resistance	R_S		0.65	2	Ω	I_{REF}(min) to I_{REF}(max)
Reverse Dynamic Impedance	Z_R		0.5	1	Ω	I_{REF}=1mA, f=100Hz I_{AC}=0.1 I_{REF}
Wideband Noise Voltage	E_N		70		µV (rms)	I_{REF}=150µA f=10Hz to 10kHz

*Package option A=3 pin device, Y=2 pin device

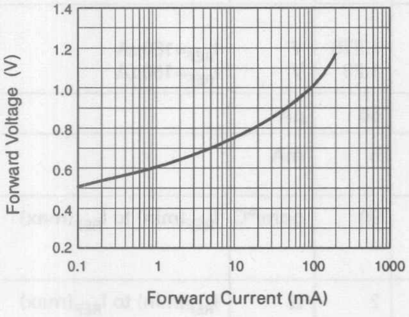
$$T_C = \frac{V_{REF}\ Change\ x\ 1000000}{V_{REF}\ x\ Temperature\ Change}$$

$$R_S = \frac{V_{REF}\ Change\ (I_{REF}\ (min)\ to\ I_{REF}\ (max))}{I_{REF}\ (max) - I_{REF}\ (min)}$$

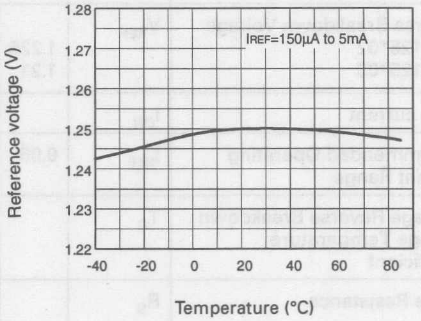


Reverse Characteristics

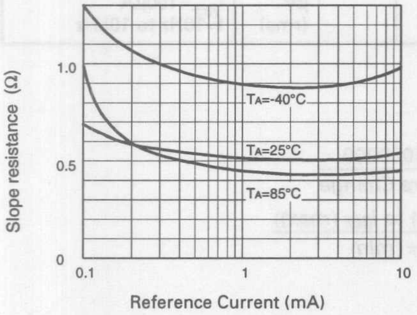
TYPICAL CHARACTERISTICS



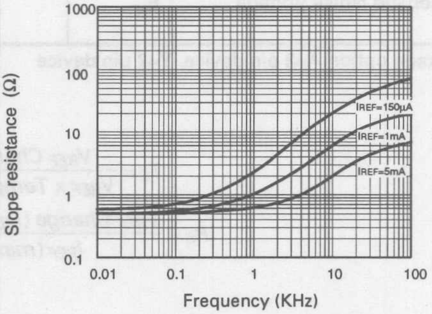
Forward Characteristics



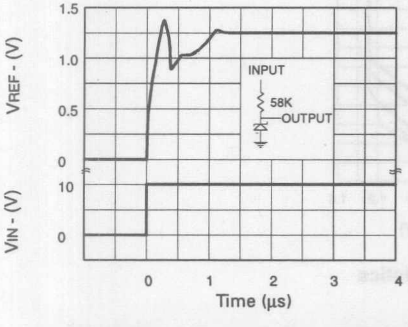
Temperature Drift



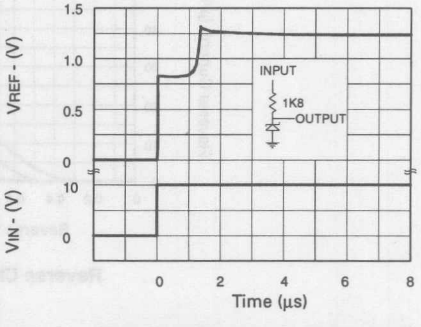
Slope Resistance v Current



Slope Resistance v Frequency



Transient Response (IREF=150μA)



Transient Response (IREF=5mA)

PRECISION 2.45 VOLT MICROPOWER VOLTAGE REFERENCE

ZRA245

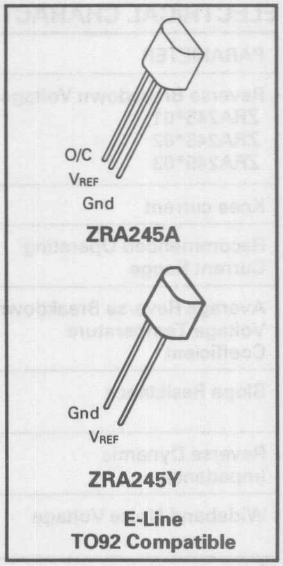
ISSUE 1 – OCTOBER 94

FEATURES

- No stabilising capacitor required
- Typical T_C 15 ppm/°C
- Typical slope resistance 0.26Ω
- ±3%, 2% or 1% tolerance
- Industrial temperature range
- Operating current 2mA to 120mA

APPLICATIONS

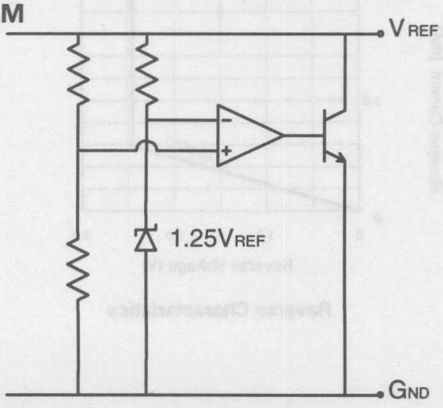
- Battery powered and portable equipment
- Metering and measurement systems
- Instrumentation
- Test equipment
- Data acquisition systems
- Precision power supplies



ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Reverse Curent	I_R	200	mA
Forward Current	I_F	25	mA
Power Dissipation at T_{amb}=25°C	P_{tot}	500	mW
Operating Temperature	T_j	-40 to 85	°C
Storage Temperature	T_{stg}	-55 to 125	°C

SCHEMATIC DIAGRAM



ZRA245

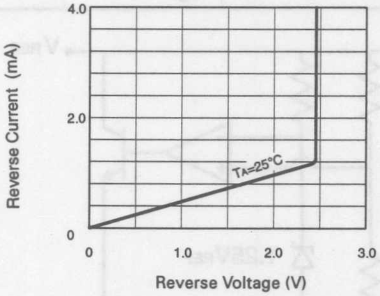
ELECTRICAL CHARACTERISTICS (at T_{amb}=25°C)

PARAMETER	SYMBOL	MIN	TYP.	MAX	UNITS	CONDITIONS
Reverse Breakdown Voltage	V_{REF}					
ZRA245*01		2.43	2.45	2.47	V	I_{REF}= 5mA
ZRA245*02		2.40	2.45	2.50	V	I_{REF}= 5mA
ZRA245*03		2.38	2.45	2.52	V	I_{REF}= 5mA
Knee current	I_{ON}			2	mA	
Recommended Operating Current Range	I_{REF}	2		120	mA	
Average Reverse Breakdown Voltage Temperature Coefficient	T_C		15	50	ppm/°C	I_{REF}(min) to I_{REF}(max)
Slope Resistance	R_S		0.26	0.5	Ω	I_{REF}(min) to I_{REF}(max)
Reverse Dynamic Impedance	Z_R		0.28	1.0	Ω	I_{REF}=5mA, f=100Hz I_{AC}=0.1 I_{REF}
Wideband Noise Voltage	E_N		65		µV (rms)	I_{REF}=5mA f=10Hz to 10kHz

*Package option A=3 pin device, Y=2 pin device

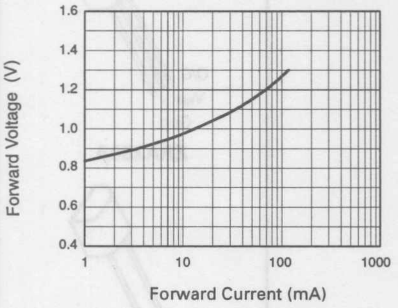
$$T_C = \frac{V_{REF}\ Change \times 1000000}{V_{REF} \times Temperature\ Change}$$

$$R_S = \frac{V_{REF}\ Change\ (I_{REF}\,(min)\ to\ I_{REF}\,(max))}{I_{REF}\,(max) - I_{REF}\,(min)}$$

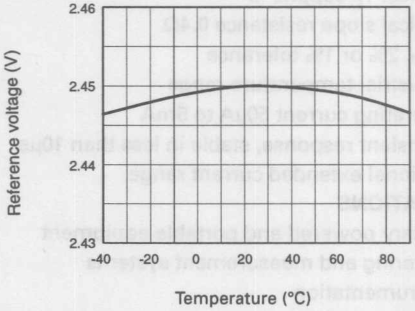


Reverse Characteristics

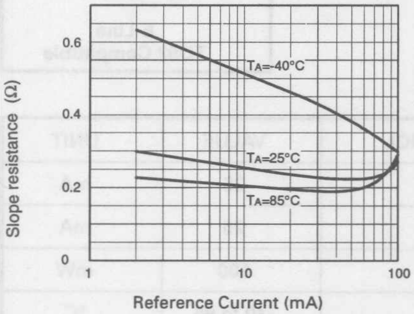
TYPICAL CHARACTERISTICS



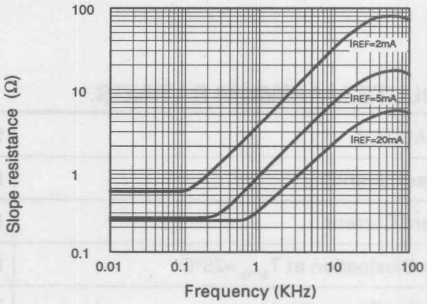
Forward Characteristics



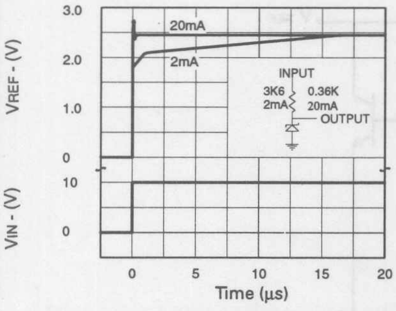
Temperature Drift



Slope Resistance v Current



Slope Resistance v Frequency



Transient Response

PRECISION 2.5 VOLT MICROPOWER VOLTAGE REFERENCE

ZRA250

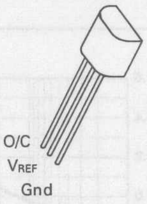
ISSUE 1 – FEB 94

FEATURES

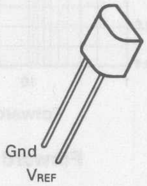
- No stabilising capacitor required
- Typical T_C 30ppm/°C
- Typical slope resistance 0.4Ω
- ±3%, 2% or 1% tolerance
- Industrial temperature range
- Operating current 50µA to 5mA
- Transient response, stable in less than 10µs
- Optional extended current range

APPLICATIONS

- Battery powered and portable equipment
- Metering and measurement systems
- Instrumentation
- Test equipment
- Data acquisition systems
- Precision power supplies



ZRA250A



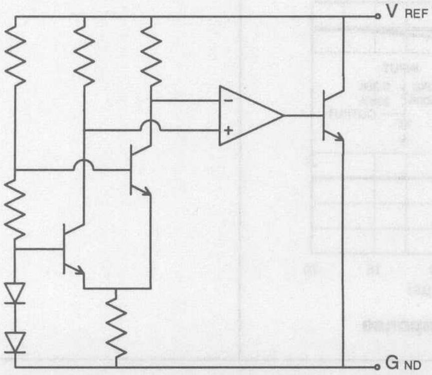
ZRA250Y

E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Reverse Curent	I_R	25	mA
Forward Current	I_F	25	mA
Power Dissipation at T_{amb}=25°C	P_{tot}	500	mW
Operating Temperature	T_j	-40 to 85	°C
Storage Temperature	T_{stg}	-55 to 125	°C

SCHEMATIC DIAGRAM



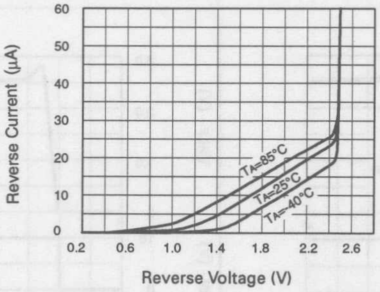
ELECTRICAL CHARACTERISTICS (at T_{amb}=25°C)

PARAMETER	SYMBOL	MIN	TYP.	MAX	UNITS	CONDITIONS
Reverse Breakdown Voltage ZRA250*01 ZRA250*02 ZRA250*03	V_{REF}	 2.475 2.45 2.425	 2.5 2.5 2.5	 2.525 2.55 2.575	 V V V	 I_{REF}=150µA I_{REF}=150µA I_{REF}=150µA
Knee current	I_{ON}		25	50	µA	
Recommended Operating Current Range	I_{REF}	0.05		5	mA	
Average Reverse Breakdown Voltage Temperature Coefficient	T_C		30	90	ppm/°C	I_{REF}(min) to I_{REF}(max)
Slope Resistance	R_S		0.4	2	Ω	I_{REF}(min) to I_{REF}(max)
Reverse Dynamic Impedance	Z_R		0.3	0.8	Ω	I_{REF}=1mA, f=100Hz I_{AC}=0.1 I_{REF}
Wideband Noise Voltage	E_N		43		µV (rms)	I_{REF}=150µA f=10Hz to 10kHz

*Package option A=3 pin device, Y=2 pin device

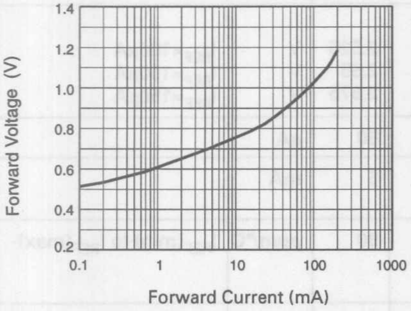
$$T_C = \frac{V_{REF}\ Change \times 1000000}{V_{REF} \times Temperature\ Change}$$

$$R_S = \frac{V_{REF}\ Change\ (I_{REF}\,(min)\ to\ I_{REF}\,(max))}{I_{REF}\,(max) - I_{REF}\,(min)}$$

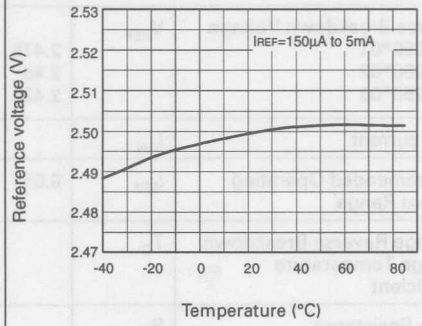


Reverse Characteristics

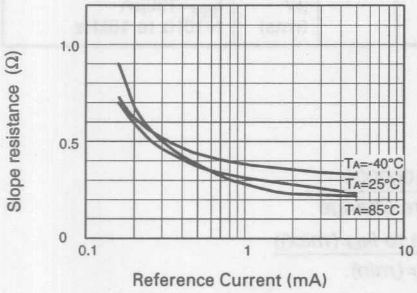
TYPICAL CHARACTERISTICS



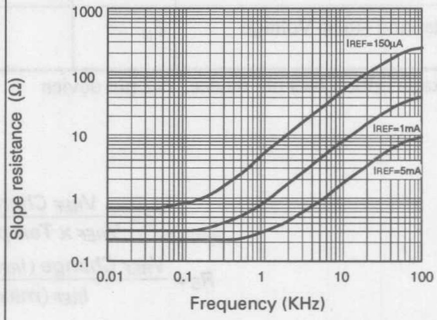
Forward Characteristics



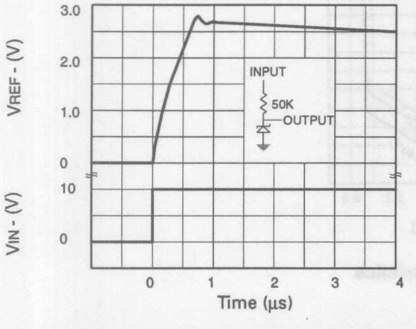
Temperature Drift



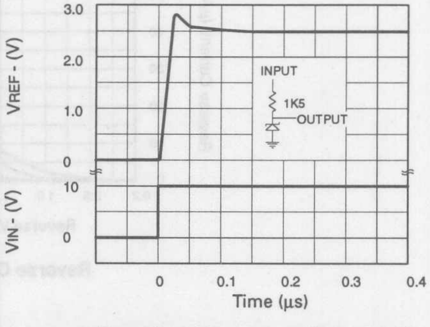
Slope Resistance v Current



Slope Resistance v Frequency



Transient Response (IREF=150µA)



Transient Response (IREF=5mA)

PRECISION 4.0 VOLT MICROPOWER VOLTAGE REFERENCE

ZRA400

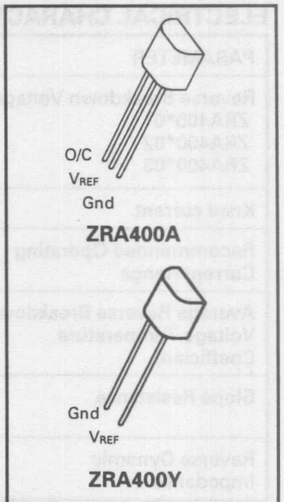
ISSUE 1 – FEB 94

FEATURES

- No stabilising capacitor required
- Typical T_C 15ppm/°C
- Typical slope resistance 0.55Ω
- ±3%, 2% or 1% tolerance
- Industrial temperature range
- Operating current 50μA to 5mA

APPLICATIONS

- Battery powered and portable equipment
- Metering and measurement systems
- Instrumentation
- Test equipment
- Data acquisition systems
- Precision power supplies
- Crystal oscillators

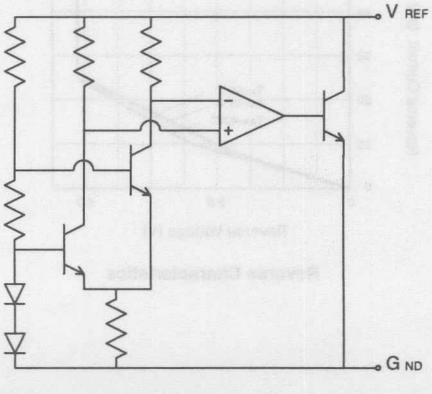


E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Reverse Curent	I_R	25	mA
Forward Current	I_F	25	mA
Power Dissipation at T_{amb}=25°C	P_{tot}	500	mW
Operating Temperature	T_j	-40 to 85	°C
Storage Temperature	T_{stg}	-55 to 125	°C

SCHEMATIC DIAGRAM



ZRA400

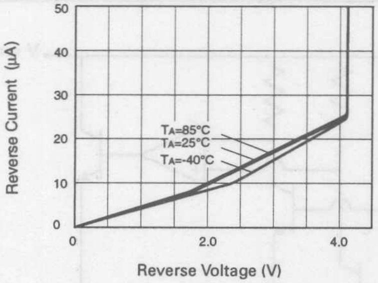
ELECTRICAL CHARACTERISTICS (at T_{amb}=25°C)

PARAMETER	SYMBOL	MIN	TYP.	MAX	UNITS	CONDITIONS
Reverse Breakdown Voltage ZRA400*01 ZRA400*02 ZRA400*03	V_{REF}	 4.05 4.01 3.97	 4.096 4.096 4.096	 4.14 4.18 4.22	 V V V	 I_{REF}=150μA I_{REF}=150μA I_{REF}=150μA
Knee current	I_{ON}		25	50	μA	
Recommended Operating Current Range	I_{REF}	0.05		5	mA	
Average Reverse Breakdown Voltage Temperature Coefficient	T_C		15	50	ppm/°C	I_{REF}(min) to I_{REF}(max)
Slope Resistance	R_S		0.55	2	Ω	I_{REF}(min) to I_{REF}(max)
Reverse Dynamic Impedance	Z_R		0.5	1.2	Ω	I_{REF}=1mA, f=100Hz I_{AC}=0.1 I_{REF}

*Package option A=3 pin device, Y=2 pin device

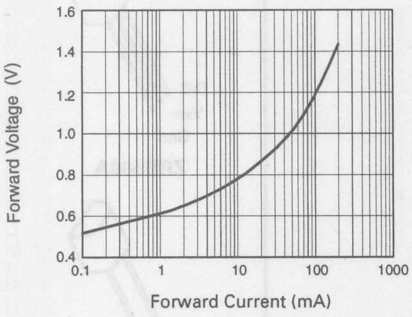
$$T_C = \frac{V_{REF}\ Change \times 1000000}{V_{REF} \times Temperature\ Change}$$

$$R_S = \frac{V_{REF}\ Change\ (I_{REF}\,(min)\ to\ I_{REF}\,(max))}{I_{REF}\,(max) - I_{REF}\,(min)}$$

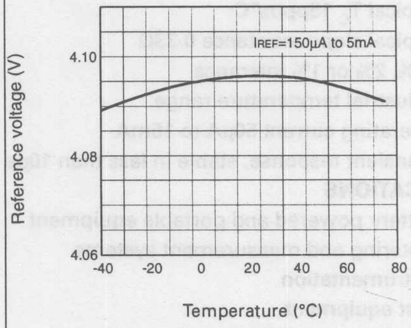


Reverse Characteristics

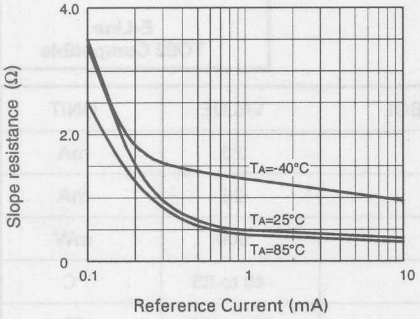
TYPICAL CHARACTERISTICS



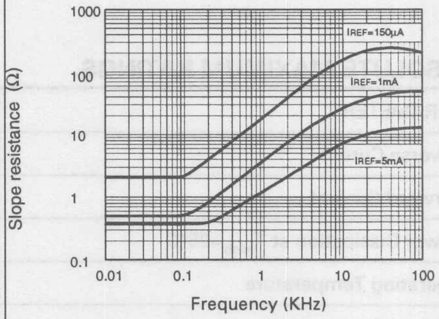
Forward Characteristics



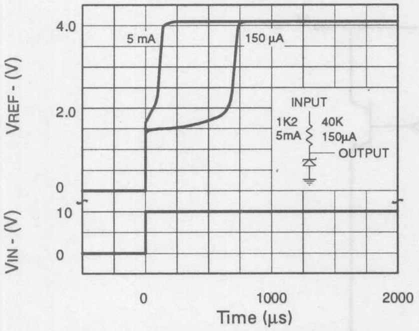
Temperature Drift



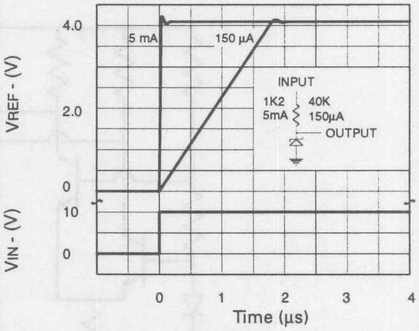
Slope Resistance v Current



Slope Resistance v Frequency



Transient Response
(Single Pulse)



Transient Response
(Repetative Pulse)

PRECISION 5.0 VOLT MICROPOWER VOLTAGE REFERENCE

ZRB500

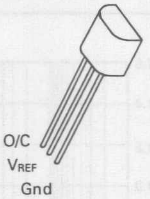
ISSUE 1 – FEB 94

FEATURES

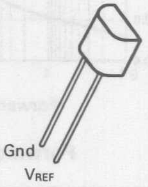
- No stabilising capacitor required
- Typical T_C 15ppm/°C
- Typical slope resistance 0.33Ω
- ±3%, 2% or 1% tolerance
- Industrial temperature range
- Operating current 50µA to 15mA
- Transient response, stable in less than 10µs

APPLICATIONS

- Battery powered and portable equipment
- Metering and measurement systems
- Instrumentation
- Test equipment
- Data acquisition systems
- Precision power supplies



ZRB500A



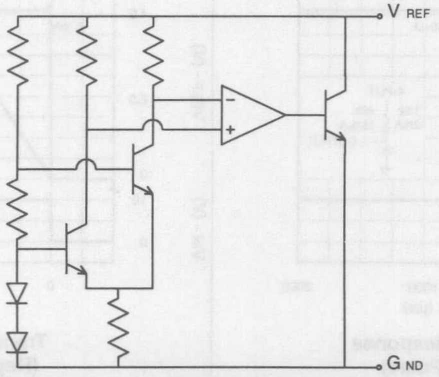
ZRB500Y

E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Reverse Curent	I_R	25	mA
Forward Current	I_F	25	mA
Power Dissipation at T_{amb}=25°C	P_{tot}	500	mW
Operating Temperature	T_j	-40 to 85	°C
Storage Temperature	T_{stg}	-55 to 125	°C

SCHEMATIC DIAGRAM



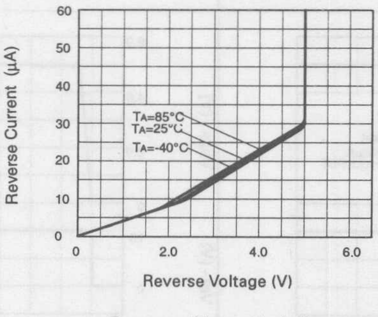
ELECTRICAL CHARACTERISTICS (at T_{amb}=25°C)

PARAMETER	SYMBOL	MIN	TYP.	MAX	UNITS	CONDITIONS
Reverse Breakdown Voltage ZRB500*01 ZRB500*02 ZRB500*03	V_{REF}	 4.95 4.90 4.85	 5.0 5.0 5.0	 5.05 5.10 5.15	 V V V	 I_{REF}=150μA I_{REF}=150μA I_{REF}=150μA
Knee current	I_{ON}		30	50	μA	
Recommended Operating Current Range	I_{REF}	0.05		15	mA	
Average Reverse Breakdown Voltage Temperature Coefficient	T_C		15	50	ppm/°C	I_{REF}(min) to I_{REF}(max)
Slope Resistance	R_S		0.33	1.5	Ω	I_{REF}(min) to I_{REF}(max)
Reverse Dynamic Impedance	Z_R		0.4	1.0	Ω	I_{REF}=1mA, f=100Hz I_{AC}=0.1 I_{REF}
Wideband Noise Voltage	E_N		100		μV (rms)	I_{REF}=150μA f=10Hz to 10kHz

*Package option A=3 pin device, Y=2 pin device

$$T_C = \frac{V_{REF}\ Change \times 1000000}{V_{REF} \times Temperature\ Change}$$

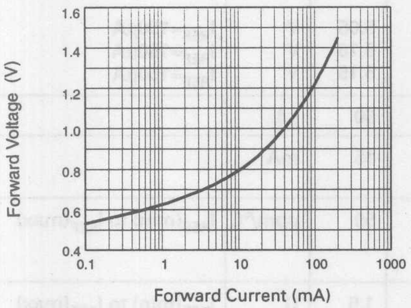
$$R_S = \frac{V_{REF}\ Change\ (I_{REF}\ (min)\ to\ I_{REF}\ (max))}{I_{REF}\ (max) - I_{REF}\ (min)}$$



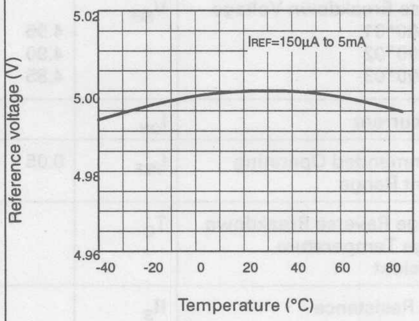
Reverse Characteristics

ZRB500

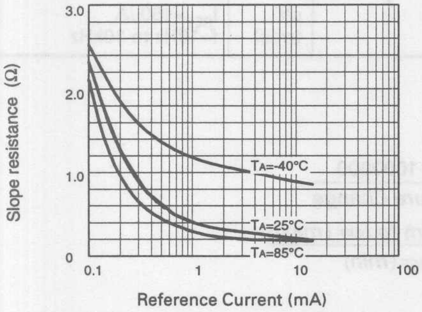
TYPICAL CHARACTERISTICS



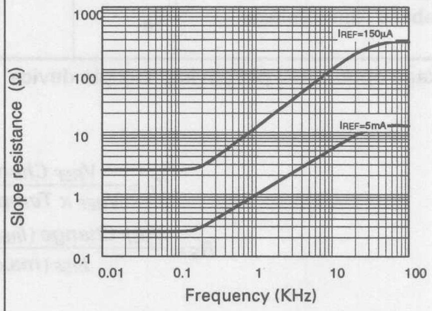
Forward Characteristics



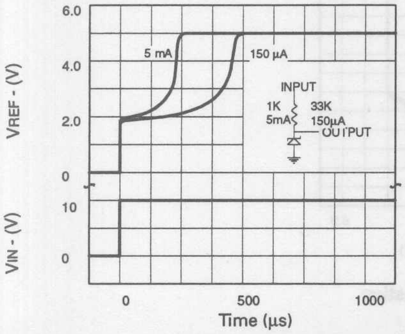
Temperature Drift



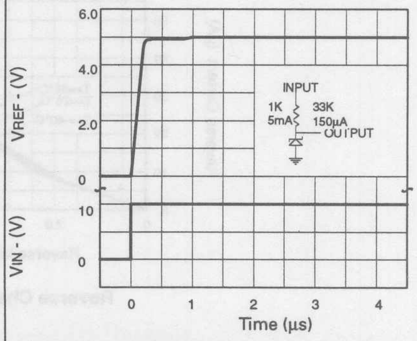
Slope Resistance v Current



Slope Resistance v Frequency



Transient Response (Single Pulse)



Transient Response (IREF=5mA) (Repetative Pulse)

PRECISION 3.3 VOLT LOW KNEE CURRENT VOLTAGE REFERENCE

ZRC330

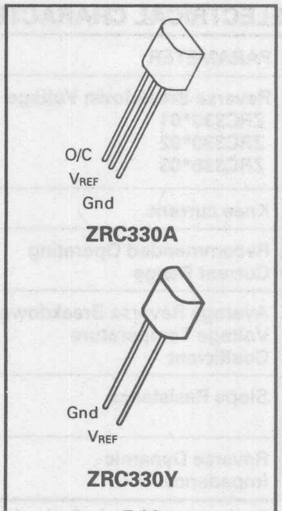
ISSUE 1 – FEB 94

FEATURES

- No stabilising capacitor required
- Low knee current, 15µA typical
- Typical slope resistance 0.6Ω
- ±3%, 2% or 1% tolerance
- Industrial temperature range
- Operating current 20µA to 5mA

APPLICATIONS

- Battery powered and portable equipment
- Metering and measurement systems
- Instrumentation
- Test equipment
- Data acquisition systems
- Precision power supplies
- Crystal oscillators

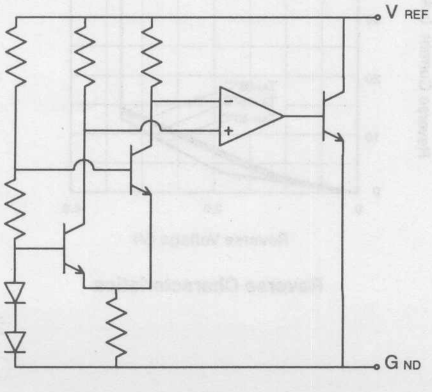


E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Reverse Curent	I_R	25	mA
Forward Current	I_F	25	mA
Power Dissipation at T_{amb}=25°C	P_{tot}	500	mW
Operating Temperature	T_j	-40 to 85	°C
Storage Temperature	T_{stg}	-55 to 125	°C

SCHEMATIC DIAGRAM



ZRC330

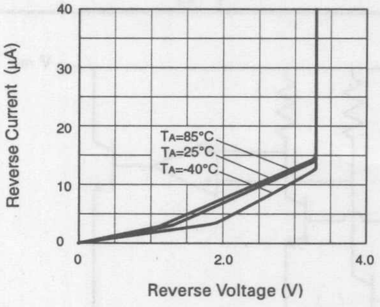
ELECTRICAL CHARACTERISTICS (at T_{amb}=25°C)

PARAMETER	SYMBOL	MIN	TYP.	MAX	UNITS	CONDITIONS
Reverse Breakdown Voltage	V_{REF}					
ZRC330*01		3.27	3.3	3.33	V	I_{REF}=150µA
ZRC330*02		3.234	3.3	3.366	V	I_{REF}=150µA
ZRC330*03		3.2	3.3	3.4	V	I_{REF}=150µA
Knee current	I_{ON}		15	20	µA	
Recommended Operating Current Range	I_{REF}	0.02		5	mA	
Average Reverse Breakdown Voltage Temperature Coefficient	T_C		15	50	ppm/°C	I_{REF}(min) to I_{REF}(max)
Slope Resistance	R_S		0.6	2	Ω	I_{REF}(min) to I_{REF}(max)
Reverse Dynamic Impedance	Z_R		0.5	1.2	Ω	I_{REF}=1mA, f=100Hz I_{AC}=0.1 I_{REF}

*Package option A=3 pin device, Y=2 pin device

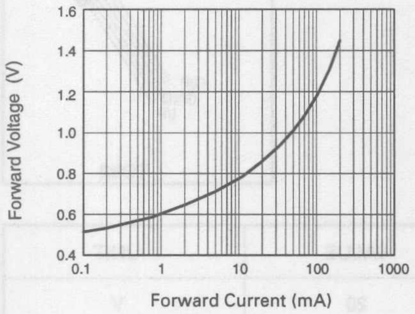
$$T_C = \frac{V_{REF}\ Change\ x\ 1000000}{V_{REF}\ x\ Temperature\ Change}$$

$$R_S = \frac{V_{REF}\ Change\ (I_{REF}\ (min)\ to\ I_{REF}\ (max))}{I_{REF}\ (max) - I_{REF}\ (min)}$$

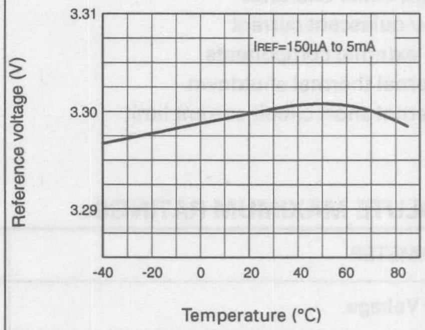


Reverse Characteristics

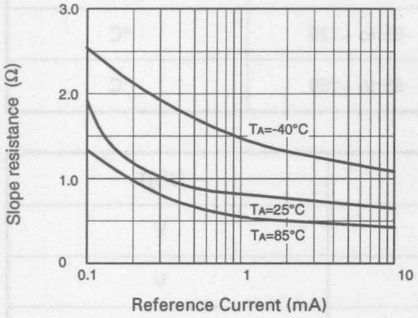
TYPICAL CHARACTERISTICS



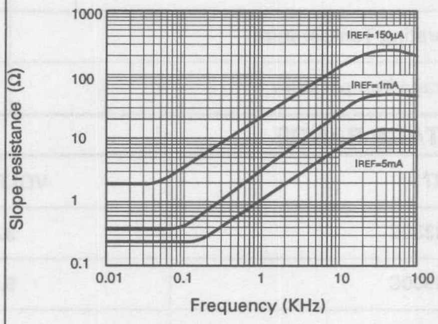
Forward Characteristics



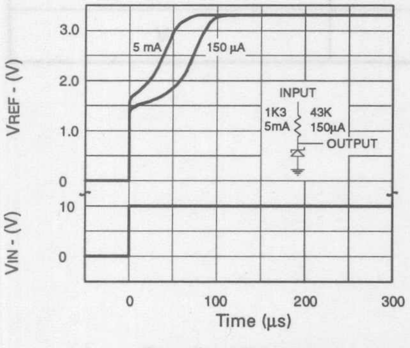
Temperature Drift



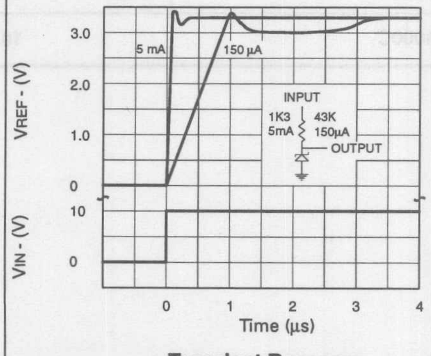
Slope Resistance v Current



Slope Resistance v Frequency



Transient Response
(Single Pulse)



Transient Response
(Repetative Pulse)

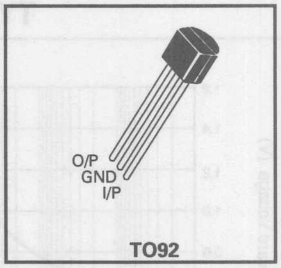
3 TO 10 VOLT FIXED POSITIVE LOCAL VOLTAGE REGULATORS

ZSR SERIES 1

ISSUE 1 – OCTOBER 94

FEATURES

- Output current up to 200mA
- Tight initial tolerance
- Low quiescent current
- No external components
- Internal thermal shutdown
- Internal short circuit current limit



ABSOLUTE MAXIMUM RATINGS

PARAMETER	VALUE	UNIT
Input Voltage	20	V
Output Current (I_O)	200	mA
Package Power Dissipation	600	mW
Operating Temperature	-55 to +125	°C
Storage Temperature	-65 to +150	°C

VOLTAGE RANGE

PART	VOLTAGE	UNIT
ZSR330C	3.3	V
ZSR500C	5.0	V
ZSR600C	6.0	V
ZSR800C	8.0	V
ZSR1000C	10.0	V

Note:

1. The maximum operating input voltage and output current of the device will be governed by the maximum power dissipation. Maximum package power dissipation is specified at 25 °C and must be linearly derated to zero at T_{amb}=125°C.

2. The following data represents pulse test conditions with junction temperatures as indicated at the initiation of the test. Continuous operation of the devices with the stated conditions might exceed the power dissipation limits of the package.

3. The shut down feature of the device operates if its temperature exceeds its design limit as might occur during external faults, short circuits etc. If the regulator is supplied from an inductive source then a large voltage transient, on the regulator input, can result should the shut down circuit operate. It is advised that a capacitor (1µF or greater) should be applied across the regulator input to ensure that the maximum voltage rating of the device is not exceeded under shutdown conditions.

ZSR330
TEST CONDITIONS (Unless otherwise stated):T_j=25°C, I_O=100mA, V_{in}=7.3V

SYMBOL	Parameter	Conditions	Min.	Typ.	Max.	Units
V_O	Output Voltage		3.218	3.3	3.382	V
		I_O=1 to 200mA T_j=-55 to 125°C	3.168		3.432	V
		V_{in}=5.3 to 20V I_O=1 to 100mA T_j=-55 to 125°C	3.168		3.432	V
ΔV_O	Line Regulation	V_{in}=5.3 to 20V		7.5	30	mV
ΔV_O	Load Regulation	I_O=1 to 200mA I_O=1 to 100mA		5 2	25	mV mV
I_q	Quiescent Current	T_j=-55 to 125°C		350	600	µA
ΔI_q	Quiescent Current Change	I_O=1 to 200mA V_{in}=5.3 to 20V			50 100	µA µA
V_n	Output Noise Voltage	f=10Hz to 10KHz		50		µV rms
$\Delta V_{in}/\Delta V_O$	Ripple Rejection	V_{in}=6.3 to 18V f=120Hz	50	64		dB
V_{in}	Input Voltage Required To Maintain Regulation		5.3	5		V
$\Delta V_O/\Delta T$	Average Temperature Coefficient of V_O	I_O=5.0mA T_j=-55 to 125°C		0.1		mV/°C

ZSR500

TEST CONDITIONS (Unless otherwise stated): T_j=25°C, I_O=100mA, V_{in}=9V

SYMBOL	Parameter	Conditions	Min.	Typ.	Max.	Units
V_O	Output Voltage		4.875	5	5.125	V
		I_O=1 to 200mA T_j=-55 to 125°C	4.8		5.2	V
		V_{in}=7 to 20V I_O=1 to 100mA T_j=-55 to 125°C	4.8		5.2	V
ΔV_O	Line Regulation	V_{in}=7 to 20V		10	40	mV
ΔV_O	Load Regulation	I_O=1 to 200mA I_O=1 to 100mA		5 2	25	mV mV
I_q	Quiescent Current	T_j=-55 to 125°C		350	600	µA
ΔI_q	Quiescent Current Change	I_O=1 to 200mA V_{in}=7 to 20V			50 100	µA µA
V_n	Output Noise Voltage	f=10Hz to 10KHz		75		µV rms
$\Delta V_{in}/\Delta V_O$	Ripple Rejection	V_{in}=8 to 18V f=120Hz	48	62		dB
V_{in}	Input Voltage Required To Maintain Regulation		7	6.7		V
$\Delta V_O/\Delta T$	Average Temperature Coefficient of V_O	I_O=5.0mA T_j=-55 to 125°C		0.1		mV/°C

ZSR600

TEST CONDITIONS (Unless otherwise stated): T_j=25°C, I_O=100mA, V_{in}=10V

SYMBOL	Parameter	Conditions	Min.	Typ.	Max.	Units
V_O	Output Voltage		5.85	6	6.15	V
		I_O=1 to 200mA T_j=-55 to 125°C	5.76		6.24	V
		V_{in}=8 to 20V I_O=1 to 100mA T_j=-55 to 125°C	5.76		6.24	V
ΔV_O	Line Regulation	V_{in}=8 to 20V		10	40	mV
ΔV_O	Load Regulation	I_O=1 to 200mA I_O=1 to 100mA		7 2.5	30	mV mV
I_q	Quiescent Current	T_j=-55 to 125°C		350	600	µA
ΔI_q	Quiescent Current Change	I_O=1 to 200mA V_{in}=8 to 20V			50 100	µA µA
V_n	Output Noise Voltage	f=10Hz to 10KHz		90		µV rms
$\Delta V_{in}/\Delta V_O$	Ripple Rejection	V_{in}=9 to 18V f=120Hz	48	62		dB
V_{in}	Input Voltage Required To Maintain Regulation		8	7.7		V
$\Delta V_O/\Delta T$	Average Temperature Coefficient of V_O	I_O=5.0mA T_j=-55 to 125°C		0.15		mV/°C

ZSR800

TEST CONDITIONS (Unless otherwise stated):T_j=25°C, I_O=100mA, V_{in}=12V

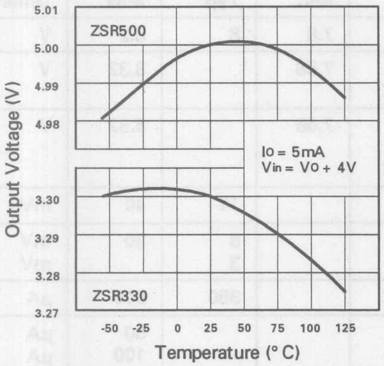
SYMBOL	Parameter	Conditions	Min.	Typ.	Max.	Units
V_O	Output Voltage		7.8	8	8.2	V
		I_O=1 to 200mA T_j=-55 to 125°C	7.68		8.32	V
		V_{in}=10 to 20V I_O=1 to 100mA T_j=-55 to 125°C	7.68		8.32	V
ΔV_O	Line Regulation	V_{in}=10 to 20V		11	40	mV
ΔV_O	Load Regulation	I_O=1 to 200mA I_O=1 to 100mA		8 3	30	mV mV
I_q	Quiescent Current	T_j=-55 to 125°C		350	600	µA
ΔI_q	Quiescent Current Change	I_O=1 to 200mA V_{in}=10 to 20V			50 100	µA µA
V_n	Output Noise Voltage	f=10Hz to 10KHz		115		µV rms
$\Delta V_{in}/\Delta V_O$	Ripple Rejection	V_{in}=11 to 18V f=120Hz	44	60		dB
V_{in}	Input Voltage Required To Maintain Regulation		10	9.7		V
$\Delta V_O/\Delta T$	Average Temperature Coefficient of V_O	I_O=5.0mA T_j=-55 to 125°C		0.25		mV/°C

ZSR1000

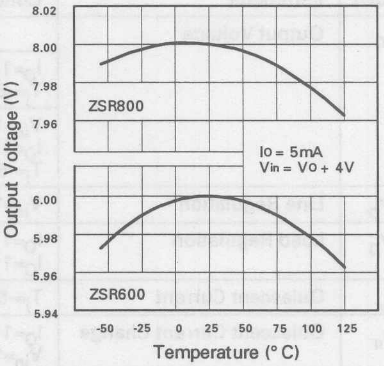
TEST CONDITIONS (Unless otherwise stated):T_j=25°C, I_O=100mA, V_{in}=14V

SYMBOL	Parameter	Conditions	Min.	Typ.	Max.	Units
V_O	Output Voltage		9.75	10	10.25	V
		I_O=1 to 200mA T_j=-55 to 125°C	9.6		10.4	V
		V_{in}=12 to 20V I_O=1 to 100mA T_j=-55 to 125°C	9.6		10.4	V
ΔV_O	Line Regulation	V_{in}=12 to 20V		12	40	mV
ΔV_O	Load Regulation	I_O=1 to 200mA I_O=1 to 100mA		9 3	30	mV mV
I_q	Quiescent Current	T_j=-55 to 125°C		350	600	µA
ΔI_q	Quiescent Current Change	I_O=1 to 200mA V_{in}=12 to 20V			50 100	µA µA
V_n	Output Noise Voltage	f=10Hz to 10KHz		150		µV rms
$\Delta V_{in}/\Delta V_O$	Ripple Rejection	V_{in}=13 to 18V f=120Hz	43	57		dB
V_{in}	Input Voltage Required To Maintain Regulation		12	11.7		V
$\Delta V_O/\Delta T$	Average Temperature Coefficient of V_O	I_O=5.0mA T_j=-55 to 125°C		0.25		mV/°C

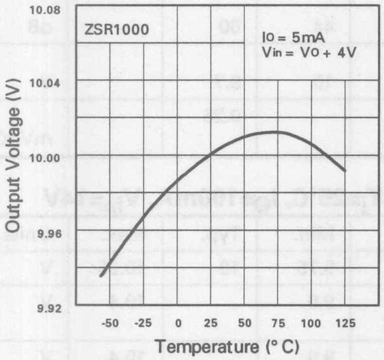
TYPICAL CHARACTERISTICS



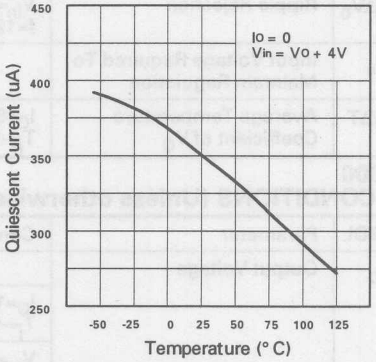
Output Voltage Temperature Coefficient



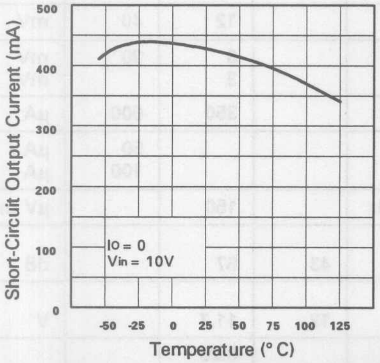
Output Voltage Temperature Coefficient



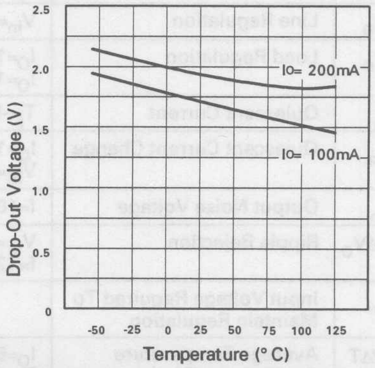
Output Voltage Temperature Coefficient



Quiescent Current v Temperature

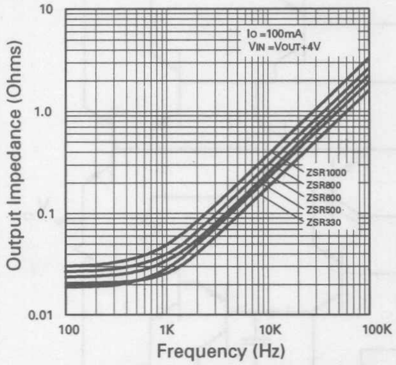


Peak Output Current v Temperature

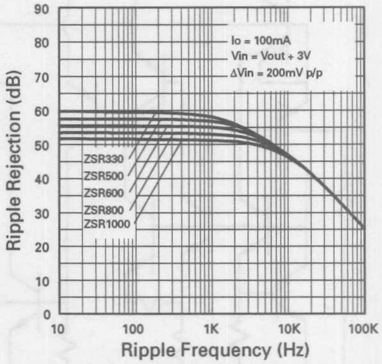


Drop-Out Voltage v Temperature

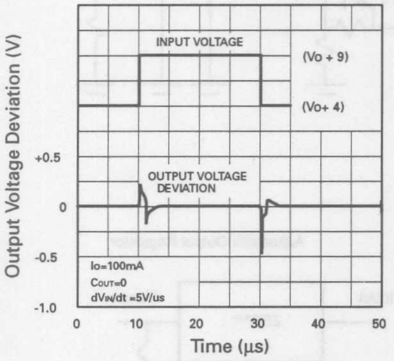
TYPICAL CHARACTERISTICS



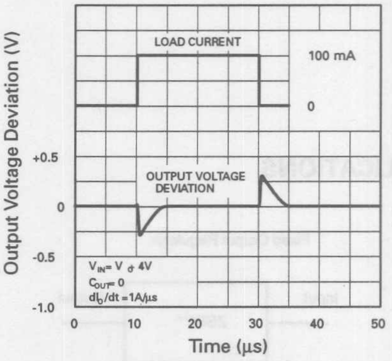
Output Impedance v Frequency



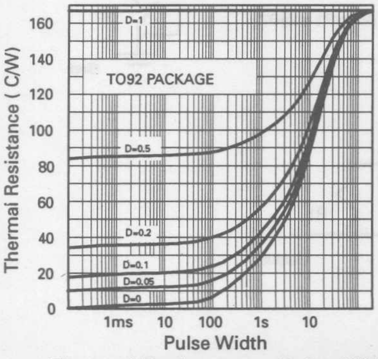
Ripple Rejection v Ripple Frequency



Line Transient Response



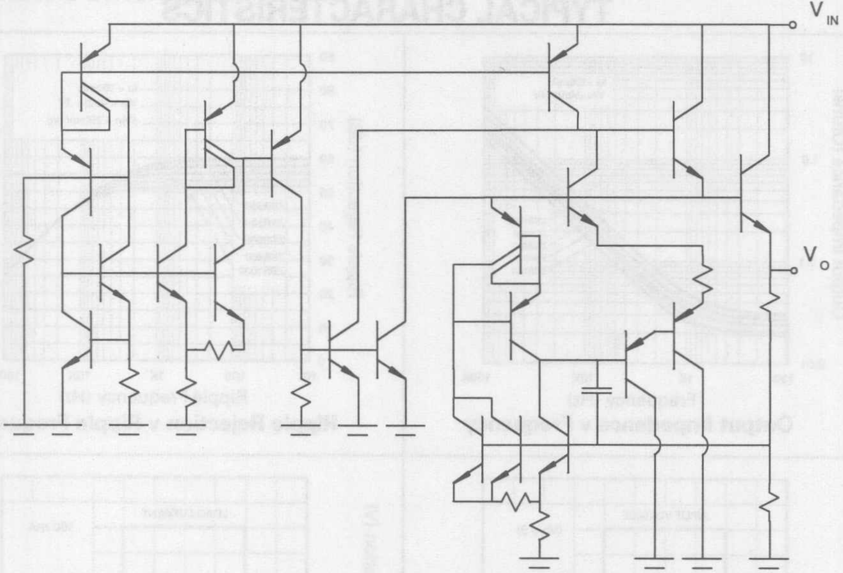
Load Transient Response



Thermal Resistance v Pulse Width

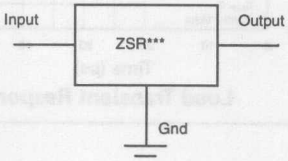
ZSR
SERIES 1

SCHEMATIC DIAGRAM

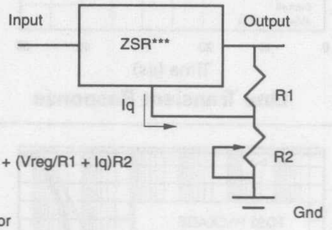


APPLICATIONS

Fixed Output Regulator

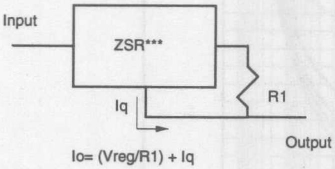


Adjustable Output Regulator



Vo= Vreg + (Vreg/R1 + Iq)R2

Current Regulator



Io= (Vreg/R1) + Iq

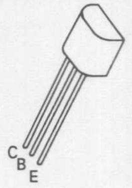
PNP SILICON PLANAR LOW NOISE TRANSISTOR

ZTX214C

ISSUE 2 – MARCH 94

FEATURES
- Low noise
- High gain

APPLICATIONS
- Audio circuits
- Instrumentation



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	-45	V
Collector-Emitter Voltage	V_{CEO}	-30	V
Emitter-Base Voltage	V_{EBO}	-5	V
Continuous Collector Current	I_C	-200	mA
Power Dissipation at T_{amb}=25°C	P_{tot}	500	mW
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +175	°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C).

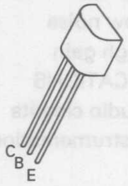
PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	-45			V	I_C=-10μA, I_E=0
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	-30			V	I_C=-2mA, I_B=0
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	-5			V	I_E=-10μA, I_C=0
Collector Cut-Off Current	I_{CBO}			-15	nA	V_{CB}=-30V
Collector-Emitter Saturation Voltage	$V_{CE(SAT)}$			-0.25 -0.6	V V	I_C=-10mA, I_B=-0.5mA* I_C=-100mA, I_B=-5mA*
Static Forward Current Transfer Ratio	h_{FE}	100 120 350		 550		I_C=-10μA, V_{CE}=-5V I_C=-100mA, V_{CE}=-5V* I_C=-2mA, V_{CE}=-5V
Transition Frequency	f_T	200			MHz	I_C=-10mA, V_{CE}=-5V f=100MHz
Output Capacitance	C_{obo}			10	pF	V_{CB}=-10V, I_E=0 f=1MHz
Noise Figure	N			10	dB	V_{CE}=-5V, I_C=-200μA f=1KHz, Δf=200Hz, R_g=2KΩ
Wide Band Noise Figure				2	dB	V_{CE}=-5V, I_C=-200μA f=30Hz to 15KHz at -3dB points, R_g=2KΩ

*Measured under pulsed conditions. Pulse width=300μs. Duty cycle ≤2%

NPN SILICON PLANAR SMALL SIGNAL TRANSISTOR

ZTX300

ISSUE 2 – MARCH 94



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	25	V
Collector-Emitter Voltage	V_{CEO}	25	V
Emitter-Base Voltage	V_{EBO}	5	V
Continuous Collector Current	I_C	500	mA
Power Dissipation at T_{amb}=25°C	P_{tot}	300	mW
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +175	°C

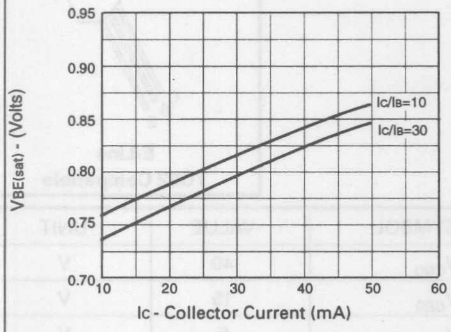
ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	25			V	I_C=10µA, I_E=0
Collector-Emitter Sustaining Voltage	$V_{CEO(sus)}$	25			V	I_C=5mA, I_B=0
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	5			V	I_E=10µA, I_C=0
Collector Cut-Off Current	I_{CBO}			0.2	µA	V_{CB}=25V, I_E=0
Emitter Cut-Off Current	I_{EBO}			0.2	µA	V_{EB}=4V, I_C=0
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$			0.35	V	I_C=50mA, I_B=5mA*
Base-Emitter Saturation Voltage	$V_{BE(sat)}$	0.65		1.0	V	I_C=10mA, I_B=1mA*
Static Forward Current Transfer Ratio	h_{FE}	50		300		I_C=10mA, V_{CE}=6V*
Transition Frequency	f_T	150			MHz	I_C=10mA, V_{CE}=6V f=100MHz
Output Capacitance	C_{obo}			6	pF	V_{CB}=6V, I_E=0 f=1MHz
Noise Figure	N		7		dB	V_{CE}=6V, f=1KHz R_S=1500Ω, I_C=100µA

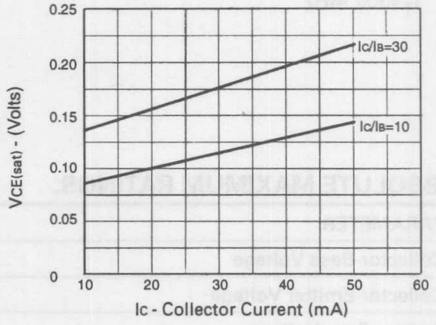
*Measured under pulsed conditions. Pulse width=300µs. Duty cycle ≤ 2%

ZTX300

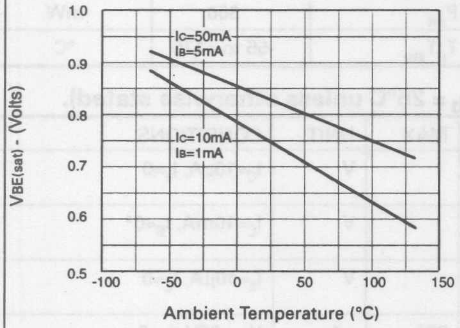
TYPICAL CHARACTERISTICS



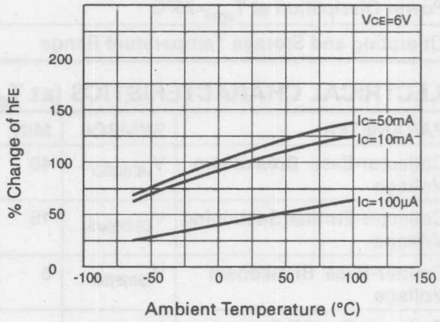
VBE(sat) v IC



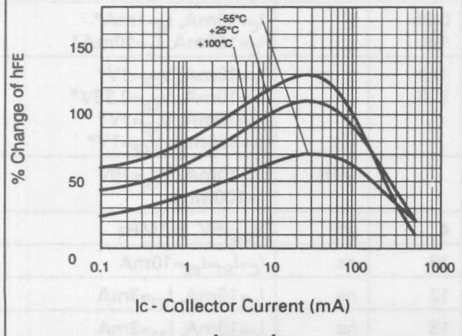
VCE(sat) v IC



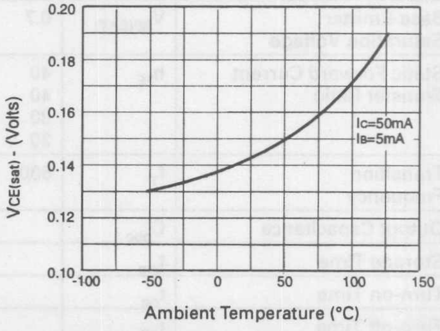
VBE(sat) v Ambient Temperature



hFE v Ambient Temperature



hFE v IC



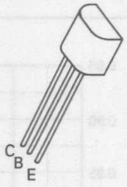
VCE(sat) v Ambient Temperature

NPN SILICON PLANAR
HIGH SPEED SWITCHING TRANSISTOR

ZTX314

ISSUE 2 – MARCH 94

FEATURES
- 15 Volt V_{CEO}
- f_T=500 MHz



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	40	V
Collector-Emitter Voltage	V_{CEO}	15	V
Emitter-Base Voltage	V_{EBO}	5	V
Base Current	I_B	100	mA
Continuous Collector Current	I_C	500	mA
Power Dissipation at T_{amb}=25°C	P_{tot}	300	mW
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +175	°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

PARAMETER	SYMBOL	MIN.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	40		V	I_C=10μA, I_E=0
Collector-Emitter Sustaining Voltage	$V_{CEO(SUS)}$	15		V	I_C=10mA, I_B=0*
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	5		V	I_E=10μA, I_C=0
Collector Cut-Off Current	I_{CBO}		200 30	nA μA	V_{CB}=20V, I_E=0 V_{CB}=20V, I_E=0, T_{amb}=100°C
Collector-Emitter Saturation Voltage	$V_{CE(SAT)}$		0.2 0.5	V V	I_C=10mA, I_B=1mA* I_C=100mA, I_B=10mA*
Base-Emitter Saturation Voltage	$V_{BE(SAT)}$	0.7	0.85 1.6	V	I_C=10mA, I_B=1mA* I_C=100mA, I_B=10mA*
Static Forward Current Transfer Ratio	h_{FE}	40 40 30 20	120 120		I_C=10mA, V_{CE}=1V* I_C=10mA, V_{CE}=0.35V* I_C=30mA, V_{CE}=1V* I_C=100mA, V_{CE}=1V*
Transition Frequency	f_T	500		MHz	I_C=10mA, V_{CE}=10V f=100MHz
Output Capacitance	C_{obo}		4	pF	V_{CB}=5V, f=1MHz
Storage Time	t_{stg}		13	ns	I_C=I_{B1}=I_{B2}=10mA
Turn-on Time	t_{on}		12	ns	I_C=10mA, I_{B1}=3mA
Turn-off Time	t_{off}		18	ns	I_C=10mA, I_{B1}=3mA, I_{B2}=1.5mA

*Measured under pulsed conditions. Pulse width=300μs. Duty cycle ≤ 2%

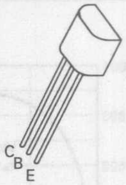
NPN SILICON PLANAR
HIGH SPEED SWITCHING TRANSISTORS

ZTX320 ZTX321
ZTX322 ZTX323

ISSUE 3 – APRIL 94

FEATURES
- 15 Volt V_{CEO}
- f_T=600 MHz

APPLICATIONS
- VHF/UHF operation



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

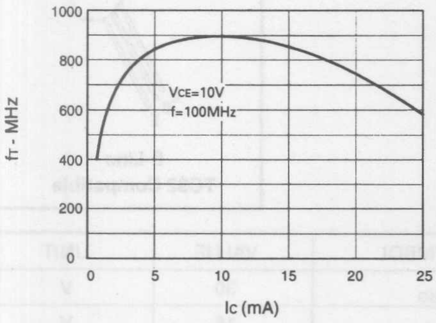
PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	30	V
Collector-Emitter Voltage	V_{CEO}	15	V
Emitter-Base Voltage	V_{EBO}	3	V
Base Current	I_B	100	mA
Continuous Collector Current	I_C	500	mA
Power Dissipation at T_{amb}=25°C	P_{tot}	300	mW
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +175	°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C).

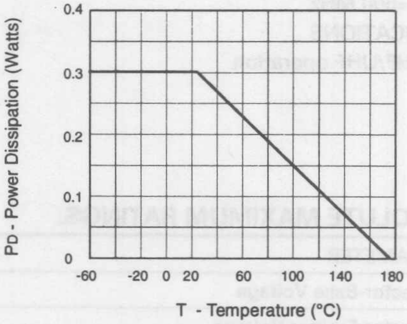
PARAMETER		SYMBOL	MIN.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage		$V_{(BR)CBO}$	30		V	I_C=10μA, I_E=0
Collector-Emitter Sustaining Voltage		$V_{CEO(SUS)}$	15		V	I_C=10mA, I_B=0
Emitter-Base Breakdown Voltage		$V_{(BR)EBO}$	3		V	I_E=10μA, I_C=0
Collector Cut-Off Current		I_{CBO}		0.01	μA	V_{CB}=15V, I_E=0
Emitter Cut-Off Current		I_{EBO}		0.2	μA	V_{EB}=2V, I_C=0
Collector-Emitter Saturation Voltage	ZTX320, ZTX322 ZTX323 ZTX321	$V_{CE(sat)}$		0.4 0.4 0.4	V V V	I_C=10mA, I_B=1mA I_C=10mA, I_B=1mA I_C=3mA, I_B=0.3mA
Base-Emitter Saturation Voltage	ZTX320, ZTX322 ZTX323 ZTX321	$V_{BE(sat)}$		1.0 1.0 1.0	V V V	I_C=10mA, I_B=1mA I_C=10mA, I_B=1mA I_C=3mA, I_B=0.3mA
Static Forward Current Transfer Ratio	ZTX320, ZTX321 ZTX322 ZTX323	h_{FE}	20 20 100	300 150 300		I_C=3mA, V_{CE}=1V I_C=3mA, V_{CE}=1V I_C=3mA, V_{CE}=1V
Output Capacitance		C_{obo}		1.7	pF	V_{CB}=10V, f=1MHz
Input Capacitance		C_{ibo}		1.6	pF	V_{EB}=0.5V, f=1MHz
Transition Frequency at f=100MHz		f_T	600 400		MHz MHz	I_C=4mA, V_{CE}=10V I_C=30mA, V_{CE}=10V
Noise Figure		N		6	dB	I_E=1mA, V_{CE}=6V R_S=400Ω, f=60MHz
Power Gain		g_{pe}	typical 15		dB	I_C=6mA, V_{CB}=12V f=200MHz

ZTX320 ZTX321
ZTX322 ZTX323

TYPICAL CHARACTERISTICS



fT v Ic



Derating Curve

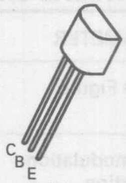
NPN SILICON PLANAR RF TRANSISTOR

ZTX325

ISSUE 2 – MARCH 94

FEATURES

- * High f_T, 1.3GHz
- * Low noise < 5dB at 500MHz
- * Power output at 500MHz >175mW



E-Line

TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	30	V
Collector-Emitter Voltage	V_{CEO}	15	V
Emitter-Base Voltage	V_{EBO}	2.5	V
Mean Collector Current (Averaged over 100µs)	I_{AV}	25	mA
Collector Current	I_{CM}	50	mA
Power Dissipation at T_{amb}=25°C	P_{tot}	350	mW
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +200	°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Emitter Sustaining Voltage	$V_{CEO(SUS)}$	15			V	I_C=10mA, I_B=0
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	5			V	I_E=10µA, I_C=0
Collector Cut-Off Current	I_{CBO}			10	nA	V_{CB}=15V, I_E=0
Emitter Cut-Off Current	I_{CES}			10	µA	V_{CE}=15V, V_{BE}=0
Static Forward Current Transfer Ratio	h_{FE}	25 20		150 125		I_C=2mA, V_{CE}=1V* I_C=25mA, V_{CE}=1V*
Transition Frequency	f_T	1.0 1.3			GHz GHz	I_C=2mA, V_{CE}=5V, f=400MHz I_C=25mA, V_{CE}=5V, f=400MHz
Capacitance, Collector Depletion Layer	C_{TC}			1.5	pF	V_{CB}=10V, I_E=I_e=0, f=1MHz
Capacitance, Emitter Depletion Layer	C_{TE}			2.0	pF	V_{EB}=0.5V, I_C=I_c=0, f=1MHz
Feedback Capacitance	$-C_{re}$		0.85		pF	V_{CE}=5V, I_C=2mA, f=1MHz
Feedback Time Constant	$r_{bb}'C_{b'c}$	2.0		12	ps	V_{CB}=5V, $-I_E$=2mA, f=10.7MHz

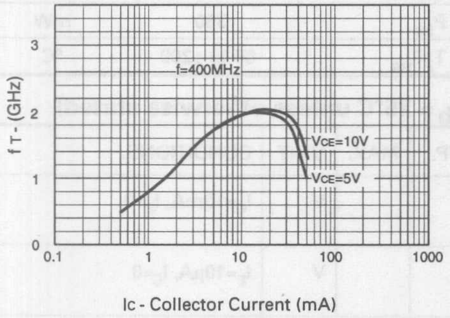
ZTX325

ELECTRICAL CHARACTERISTICS

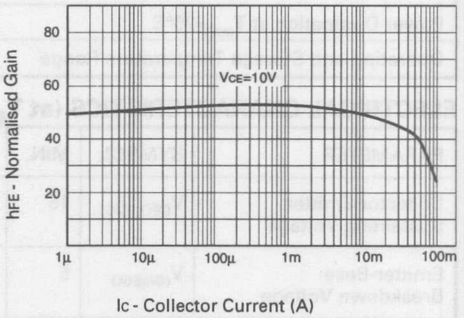
PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Noise Figure	N			5.0	dB	f=500MHz, V_{CE}=5V, I_C=2mA, R_S=50Ω
Intermodulation Distortion	d_{im}		-53		dB	I_C=14mA, V_{CE}=6V, f=217MHz V_0=100mV, R_L=37.5Ω, f_1=183MHz, f_2=200MHz
Output Power (at T_{case}=25°C)*	P_O	175			mW	V_{CE}=13.5V, I_C=22.5mA P_{in}=25mW, f=500MHz

*It is essential that care be taken to reduce steady state current when no h.f. signal is applied.

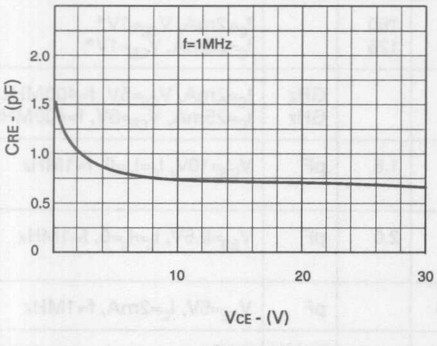
TYPICAL CHARACTERISTICS



fT v IC



hFE v IC

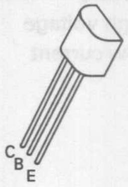


CRE v VCE

NPN SILICON PLANAR MEDIUM POWER TRANSISTOR

ISSUE 2 – MARCH 94

ZTX337C



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	50	V
Collector-Emitter Voltage	V_{CEO}	45	V
Emitter-Base Voltage	V_{EBO}	5	V
Base Current	I_B	100	mA
Continuous Collector Current	I_C	800	mA
Power Dissipation	P_{tot}	750	mW
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +175	°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	50			V	I_C=100μA
Collector-Emitter Breakdown Voltage	$V_{(BR)CES}$	45			V	I_C=100μA
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	5			V	I_E=100μA
Collector Cut-Off Current	I_{CBO}			100	nA	V_{CB}=45V, I_E=0
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$			0.7	V	I_C=500mA, I_B=50mA*
Base-Emitter Turn On Voltage	$V_{BE(on)}$			1.2	V	I_C=300mA,V_{CE}=1V*
Static Forward Current Transfer	h_{FE}	250 170		630		I_C=100mA, V_{CE}=1V* I_C=300mA, V_{CE}=1V*
Transition Frequency	f_T		200		MHz	I_C=10mA, V_{CE}=5V f=50MHz
Output Capacitance	C_{obo}		12		pF	V_{CB}=10V, f=1MHz

*Measured under pulsed conditions. Pulse width=300μs. Duty cycle ≤ 2%

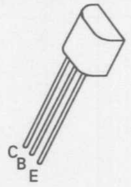
NPN SILICON PLANAR SMALL SIGNAL TRANSISTOR

ZTX341

ISSUE 2 – MARCH 94

FEATURES

- High voltage
- Low current



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

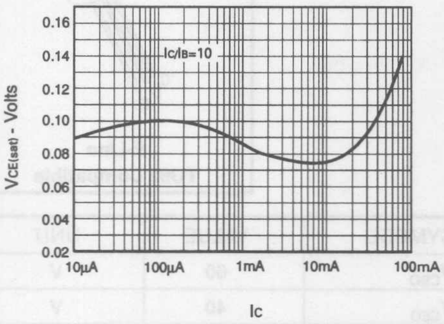
PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	100	V
Collector-Emitter Voltage	V_{CEO}	100	V
Emitter-Base Voltage	V_{EBO}	5	V
Continuous Collector Current	I_C	100	mA
Base Current	I_B	20	mA
Power Dissipation at T_{amb}=25°C	P_{tot}	300	mW
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +175	°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

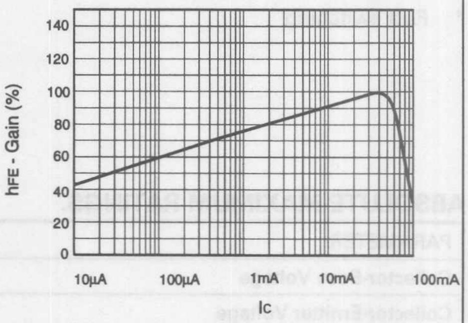
PARAMETER	SYMBOL	MIN.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	100		V	I_C=10μA, I_E=0
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	100		V	I_C=10mA, I_B=0
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	5		V	I_E=10μA, I_C=0
Collector Cut-Off Current	I_{CBO}		0.5	μA	V_{CB}=80V, I_E=0
Collecor-Emitter Cut-Off Current	I_{CER}		0.5 10	μA μA	V_{CE}=80V, R_{BE}=50KΩ V_{CE}=80V, R_{BE}=50KΩ†
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$		0.5	V	I_C=2mA, I_B=0.1mA
Base-Emitter Saturation Voltage	$V_{BE(sat)}$		1.0	V	I_C=2mA, $_B$=0.1mA
Static Forward Current Transfer Ratio	h_{FE}	30			I_C=2mA, V_{CE}=1V
Transition Frequency	f_T	80		MHz	I_C=5mA, V_{CE}=5V f=60MHz
Output Capacitance	C_{obo}		10	pF	V_{CB}=6V, f=1MHz

*Measured under pulsed conditions. Pulse width=300μs. Duty cycle ≤ 2%
†T_{amb}=100°C

TYPICAL CHARACTERISTICS



$V_{CE(sat)}$ v I_C



h_{FE} v I_C

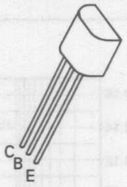
NPN SILICON PLANAR
HIGH SPEED SWITCHING TRANSISTOR

ISSUE 2 – MARCH 94

ZTX360

FEATURES

- 40 Volt V_{CEO}
- 1 Amp continuous current
- Fast switching



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	60	V
Collector-Emitter Voltage	V_{CEO}	40	V
Emitter-Base Voltage	V_{EBO}	5	V
Continuous Collector Current	I_C	1	A
Power Dissipation at T_{amb}=25°C	P_{tot}	500	W
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +175	°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Emitter Sustaining Voltage	$V_{CEO(SUS)}$	40			V	I_C=10mA, I_B=0*
Collector Cut-Off Current	I_{CBO}			500 300	nA µA	V_{CB}=40V, I_E=0 V_{CB}=40V, I_E=0, T_{amb}=150°C
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$			0.6	V	I_C=500mA, I_B=50mA*
Base-Emitter Saturation Voltage	$V_{BE(sat)}$	0.7		1.2	V	I_C=500mA, I_B=50mA*
Static Forward Current Transfer Ratio	h_{FE}	25		150		I_C=500mA, V_{CE}=1V*
Transition Frequency	f_T	200			MHz	I_C=50mA, V_{CE}=10V, f=100MHz
Input Capacitance	C_{ib}		36	50	pF	V_{EB}=0.5V, I_C=0, f=1MHz
Output Capacitance	C_{ob}		5.75	10	pF	V_{CB}=10V, I_E=0, f=1MHz
Turn-On Time	t_{on}			40	ns	V_{CC}=30V, I_C=500mA, $I_{B(on)}$=50mA, $-V_{BE(off)}$=2V
Turn-Off Time	t_{off}			75	ns	V_{CC}=30V, I_C=500mA, $I_{B(on)}$=$-I_{B(off)}$=50mA

*Measured under pulsed conditions. Pulse width=300µs. Duty cycle ≤ 2%

NPN SILICON PLANAR LOW NOISE TRANSISTOR

ZTX384C

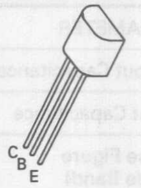
ISSUE 2 – MARCH 94

FEATURES

- 30 Volt V_{CEO}
- High Gain
- Low Noise

APPLICATIONS

- Audio circuits



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	45	V
Collector-Emitter Voltage	V_{CEO}	30	V
Emitter-Base Voltage	V_{EBO}	6	V
Continuous Collector Current	I_C	200	mA
Power Dissipation	P_{tot}	350	mW
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +175	°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	45			V	I_C=10μA, I_E=0
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	30			V	I_C=2mA, I_B=0
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	6			V	I_E=10μA, I_C=0
Collector Cut-Off Current	I_{CBO}			15	nA	V_{CB}=30V, I_E=0
Emitter Cut-Off Current	I_{EBO}			15	nA	V_{EB}=4V, I_C=0
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$			0.25 0.6	V V	I_C=10mA, I_B=0.5mA* I_C=100mA, I_B=5mA*
Base-Emitter Saturation Voltage	$V_{BE(sat)}$			1.2	V	I_C=100mA, I_B=5mA*
Base-Emitter Turn On Voltage	$V_{BE(on)}$	0.55		0.7	V	I_C=2mA, V_{CE}=5V
Static Forward Current Transfer Ratio	h_{FE}	100 250 130	 400 			I_C=10μA, V_{CE}=5V I_C=2mA, V_{CE}=5V I_C=100mA, V_{CE}=5V*
Transition Frequency	f_T	150			MHz	I_C=10mA, V_{CE}=5V f=100MHz

ZTX384C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Output Capacitance	C_{obo}		2.5	5	pF	V_{CB}=10V, f=1MHz
Input Capacitance	C_{ibo}		11		pF	V_{EB}=0.5V, f=1MHz
Noise Figure (Wide Band)	N			4	dB	I_C=200μA, V_{CE}=5V f=30Hz to 15KHz at -3dB points, R_S=2KΩ
Flicker Noise	N_f			0.135	μV	I_C=200μA, V_{CE}=5V f=10Hz to 50Hz at -3dB points, R_S=2KΩ
Small Signal Static Forward Current Transfer Ratio	h_{fe}	450		900		I_C=2mA, V_{CE}=5V, f=1kHz

*Measured under pulsed conditions. Pulse width=300μs.Duty cycle ≤ 2%

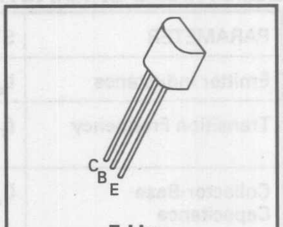
NPN SILICON PLANAR AVALANCHE TRANSISTOR

ZTX413

PROVISIONAL DATASHEET ISSUE 2 – MARCH 94

FEATURES
- Avalanche mode operation
- 50A Peak avalanche current
- Low inductance packaging

APPLICATIONS
- Laser LED drivers
- Fast edge generation
- High speed pulse generators



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	150	V
Collector-Emitter Voltage	V_{CEO}	50	V
Emitter-Base Voltage	V_{EBO}	6	V
Continuous Collector Current	I_C	200	mA
Peak Collector Current (25ns Pulse Width)	I_{CM}	50	A
Power Dissipation	P_{tot}	500	mW
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +200	°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

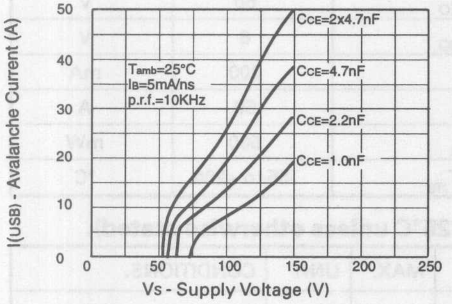
PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Emitter Breakdown Voltage	$V_{(BR)CES}$	150			V	I_C=100μA
Collector-Emitter Breakdown Voltage	$V_{CEO(sus)}$	50			V	I_C=10mA
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	6			V	I_E=100μA
Collector Cut-Off Current	I_{CBO}			0.1	μA	V_{CB}=120V
Emitter Cut-Off Current	I_{EBO}			0.1	μA	V_{EB}=4V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$			0.15	V	I_C=10mA, I_B=1mA
Base-Emitter Saturation Voltage	$V_{BE(sat)}$			0.8	V	I_C=10mA, I_B=1mA
Current in Second Breakdown (Pulsed)	I_{USB}	22 31			A A	V_C=110V, C_{CE}=4.7nF* V_C=130V, C_{CE}=4.7nF*
Static Forward Current Transfer Ratio	h_{FE}	50				I_C=10mA, V_{CE}=10V

*Measured within a circuit possessing an approximate loop inductance of 12nH. The $I_{(USB)}$ monitor circuitry reflects 0.15 Ohm into the Collector-Emitter Discharge Loop

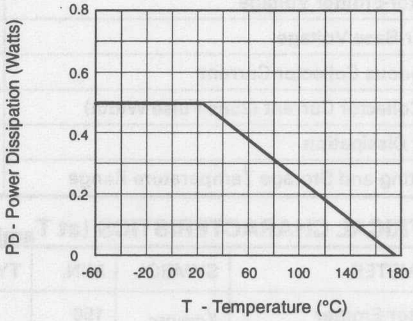
ELECTRICAL CHARACTERISTICS

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Emitter Inductance	L_e		6		nH	With 3mm leads
Transition Frequency	f_T		150		MHz	I_C=10mA, V_{CE}=5V f=20MHz
Collector-Base Capacitance	C_{cb}		2		pF	V_{CB}=10V, I_E=0 f=1MHz

TYPICAL CHARACTERISTICS



Avalanche Current v Supply Voltage



Derating Curve

NPN SILICON PLANAR AVALANCHE TRANSISTOR

ZTX415

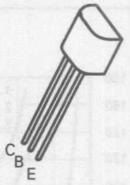
ISSUE 4 - NOVEMBER 1995

FEATURES

- Specifically designed for Avalanche mode operation
- 60A Peak Avalanche Current (Pulse width=20ns)
- Low inductance package

APPLICATIONS

- Laser LED drivers
- Fast edge generation
- High speed pulse generators
- Suitable for single, series and parallel operation



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	260	V
Collector-Emitter Voltage	V_{CEO}	100	V
Emitter-Base Voltage	V_{EBO}	6	V
Continuous Collector Current	I_C	500	mA
Peak Collector Current (Pulse Width=20ns)	I_{CM}	60	A
Power Dissipation	P_{tot}	680	mW
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +175	°C

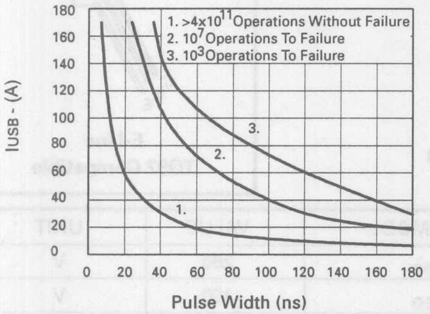
ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CES}$	260			V	I_C=1mA T_{amb}= -55 to +175°C
Collector-Emitter Breakdown Voltage	$V_{CEO(sus)}$	100			V	I_C=100µA
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	6			V	I_E=10µA
Collector Cut-Off Current	I_{CBO}			0.1 10	µA µA	V_{CB}=180V V_{CB}=180V, T_{amb}=100°C
Emitter Cut-Off Current	I_{EBO}			0.1	µA	V_{EB}=4V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$			0.5	V	I_C=10mA, I_B=1mA*
Base-Emitter Saturation Voltage	$V_{BE(sat)}$			0.9	V	I_C=10mA, I_B=1mA*
Current in Second Breakdown (Pulsed)	I_{SB}	15 25			A A	V_C=200V, C_{CE}=620pF V_C=250V, C_{CE}=620pF
Static Forward Current Transfer Ratio	h_{FE}	25				I_C=10mA, V_{CE}=10V*
Transition Frequency	f_T	40			MHz	I_C=10mA, V_{CE}=20V f=20MHz
Collector-Base Capacitance	C_{cb}			8	pF	V_{CB}=20V, I_E=0 f=100MHz

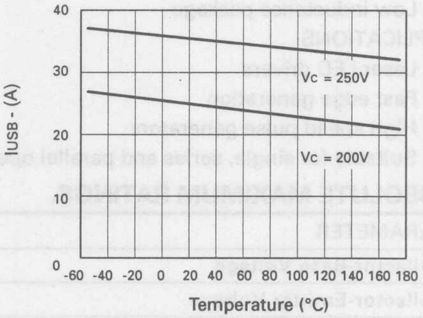
*Measured under pulsed conditions. Pulse width=300µs. Duty cycle ≤ 2%

ZTX415

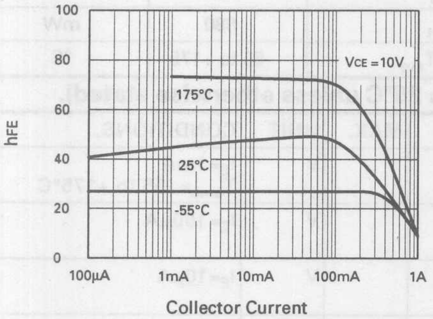
TYPICAL CHARACTERISTICS



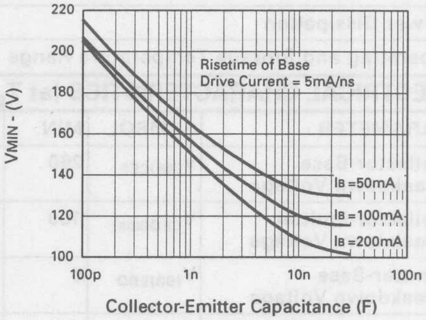
Maximum Avalanche Current v Pulse Width



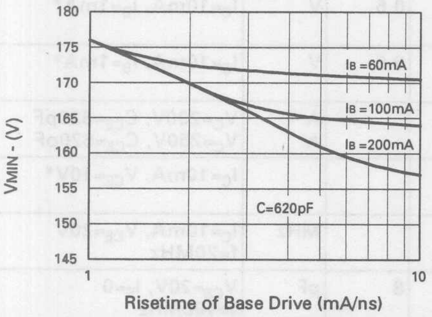
IUSB v Temperature for the specified conditions



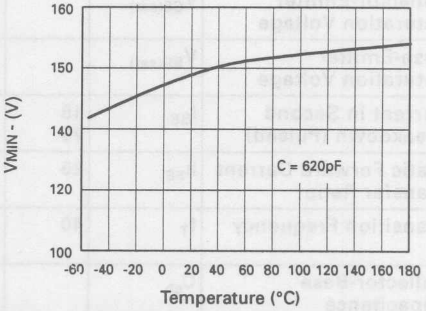
hFE v IC



Minimum starting voltage as a function of capacitance



Minimum starting voltage as a function of drive current



Minimum starting voltage as a function of temperature

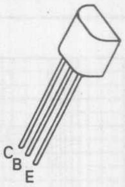
NPN SILICON PLANAR
MEDIUM POWER TRANSISTOR

ZTX449

ISSUE 2 – MARCH 1994

FEATURES

- 30 Volt V_{CEO}
- 1 Amp continuous current
- P_{tot}= 1 Watt



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	50	V
Collector-Emitter Voltage	V_{CEO}	30	V
Emitter-Base Voltage	V_{EBO}	5	V
Peak Pulse Current	I_{CM}	2	A
Continuous Collector Current	I_C	1	A
Power Dissipation at T_{amb}= 25°C	P_{tot}	1	W
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +200	°C

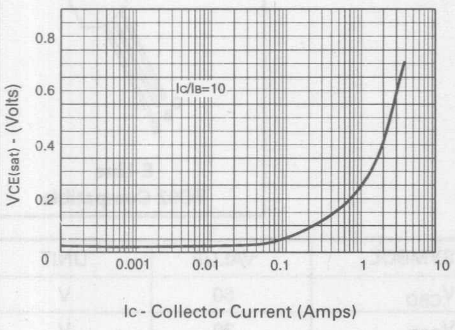
ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	50			V	I_C=100μA, I_E=0
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	30			V	IC=10mA, I_B=0
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	5			V	I_E=100μA, I_C=0
Collector Cut-Off Current	I_{CBO}			0.1 10	μA μA	V_{CB}=40V V_{CB}=40V, T_{amb}=100°C
Emitter Cut-Off Current	I_{EBO}			0.1	μA	V_{EB}=4V, I_C=0
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$			0.5 1	V V	I_C=1A, I_B=100mA* I_C=2A, I_B=200mA*
Base-Emitter Saturation Voltage	$V_{BE(sat)}$			1.25	V	I_C=1A, I_B=100mA*
Base-Emitter Turn-on Voltage	$V_{BE(on)}$			1	V	I_C=1A,V_{CE}=2V*
Static Forward Current Transfer Ratio	h_{FE}	70 100 80 40		 300		I_C=50mA, V_{CE}=2V* I_C=500mA, V_{CE}=2V* I_C=1A, V_{CE}=2V* I_C=2A, V_{CE}=2V*
Transition Frequency	f_T	150			MHz	I_C=50mA, V_{CE}=10V f=100MHz
Output Capacitance	C_{obo}			15	pF	V_{CB}=10V, f=1MHz

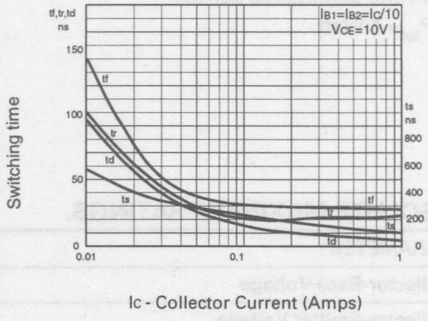
*Measured under pulsed conditions. Pulse width=300μs. Duty cycle ≤ 2%

ZTX449

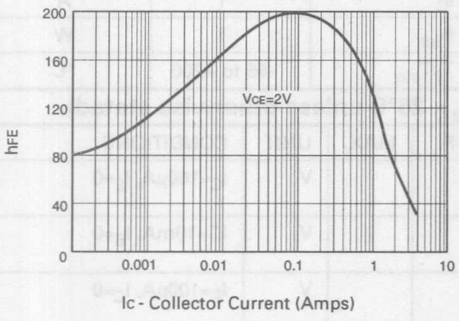
TYPICAL CHARACTERISTICS



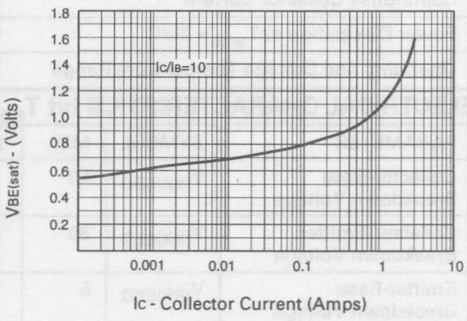
VCE(sat) v IC



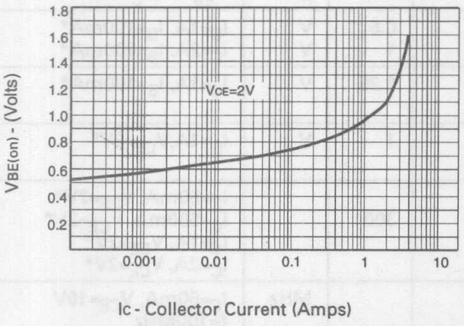
Switching Speeds



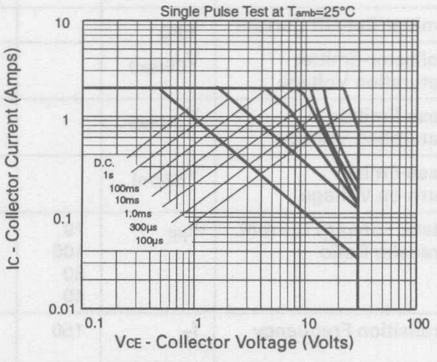
hFE v IC



VBE(sat) v IC



VBE(on) v IC



Safe Operating Area

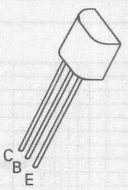
NPN SILICON PLANAR MEDIUM POWER TRANSISTORS

ZTX450
ZTX451

ISSUE 2 – MARCH 1994

FEATURES

- 60 Volt V_{CEO}
- 1 Amp continuous current
- P_{tot}= 1 Watt



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	ZTX450	ZTX451	UNIT
Collector-Base Voltage	V_{CBO}	60	80	V
Collector-Emitter Voltage	V_{CEO}	45	60	V
Emitter-Base Voltage	V_{EBO}	5		V
Peak Pulse Current	I_{CM}	2		A
Continuous Collector Current	I_C	1		A
Power Dissipation at T_{amb}=25°C	P_{tot}	1		W
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +200		°C

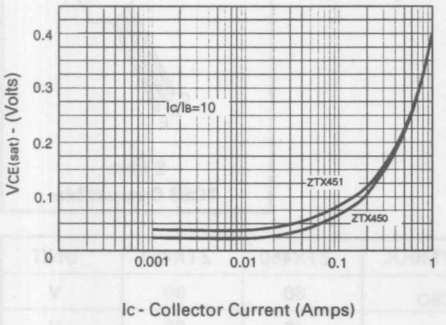
ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C).

PARAMETER	SYMBOL	ZTX450		ZTX451		UNIT	CONDITIONS.
		MIN.	MAX.	MIN.	MAX.		
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	60		80		V	I_C=100μA
Collector-Emitter Sustaining Voltage	$V_{CEO(sus)}$	45		60		V	I_C=10mA*
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	5		5		V	I_E=100μA
Collector Cut-Off Current	I_{CBO}		0.1		 0.1	μA μA	V_{CB}=45V V_{CB}=60V
Emitter Cut-Off Current	I_{EBO}		0.1		0.1	μA	V_{EB}=4V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$		0.25		0.35	V	I_C=150mA, I_B=15mA*
Base-Emitter Saturation Voltage	$V_{BE(sat)}$		1.1		1.1	V	I_C=150mA, I_B=15mA*
Static Forward Current Transfer Ratio	h_{FE}	100 15	300	50 10	150		I_C=150mA, V_{CE}=10V* I_C=1A, V_{CE}=10V*
Transition Frequency	f_T	150		150		MHz	I_C=50mA, V_{CE}=10V f=100MHz
Output Capacitance	C_{obo}		15		15	pF	V_{CB}=10V, f=1MHz

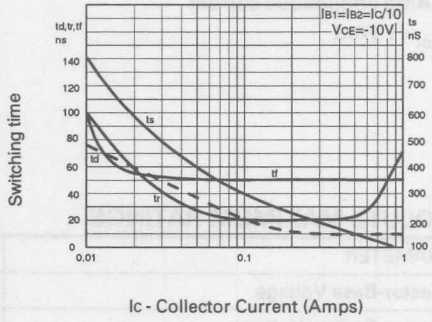
*Measured under pulsed conditions. Pulse width=300μs. Duty cycle ≤ 2%

ZTX450
ZTX451

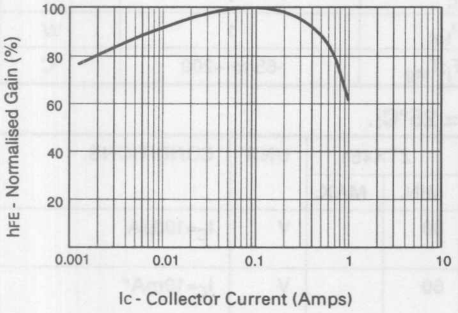
TYPICAL CHARACTERISTICS



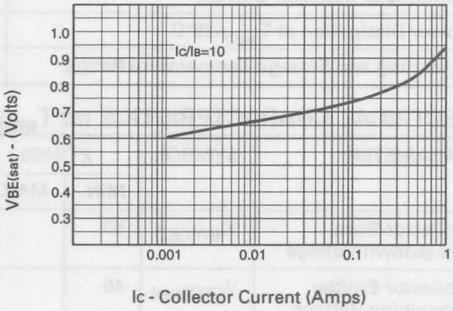
$V_{CE(sat)}$ v I_C



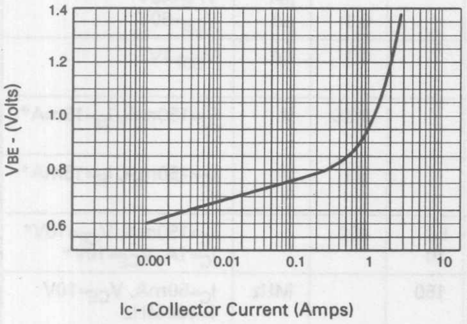
Typical Switching Speeds



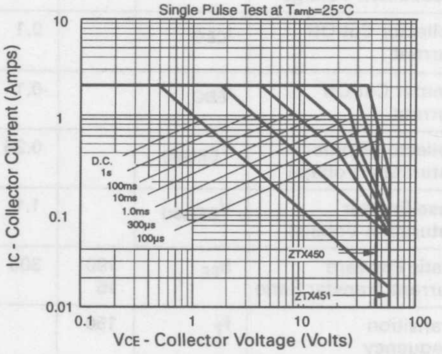
h_{FE} v I_C



$V_{BE(sat)}$ v I_C



$V_{BE(on)}$ v I_C



Safe Operating Area

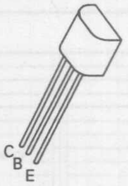
NPN SILICON PLANAR
MEDIUM POWER TRANSISTORS

ZTX452
ZTX453

ISSUE 2 – MARCH 1994

FEATURES

- * 100 Volt V_{CEO}
- * 1 Amp continuous current
- * P_{tot} = 1 Watt



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	ZTX452	ZTX453	UNIT
Collector-Base Voltage	V_{CBO}	100	120	V
Collector-Emitter Voltage	V_{CEO}	80	100	V
Emitter-Base Voltage	V_{EBO}	5		V
Peak Pulse Current	I_{CM}	2		A
Continuous Collector Current	I_C	1		A
Power Dissipation at T_{amb}=25°C	P_{tot}	1		W
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +200		°C

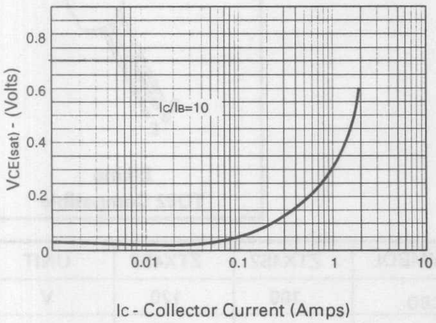
ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C).

PARAMETER	SYMBOL	ZTX452		ZTX453		UNIT	CONDITIONS.
		MIN.	MAX.	MIN.	MAX.		
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	100		120		V	I_C=100µA
Collector-Emitter Sustaining Voltage	$V_{CEO(sus)}$	80		100		V	I_C=10mA*
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	5		5		V	I_E=100µA
Collector Cut-Off Current	I_{CBO}		0.1			µA	V_{CB}=80V
					0.1	µA	V_{CB}=100V
Emitter Cut-Off Current	I_{EBO}		0.1		0.1	µA	V_{EB}=4V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$		0.7		0.7	V	I_C=150mA, I_B=15mA*
Base-Emitter Saturation Voltage	$V_{BE(sat)}$		1.3		1.3	V	I_C=150mA, I_B=15mA*
Static Forward Current Transfer Ratio	h_{FE}	40	150	40	200		I_C=150mA, V_{CE}=10V*
		10		10			I_C=1A, V_{CE}=10V*
Transition Frequency	f_T	150		150		MHz	I_C=50mA, V_{CE}=10V f=100MHz
Output Capacitance	C_{obo}		15		15	pF	V_{CB}=10V, f=1MHz

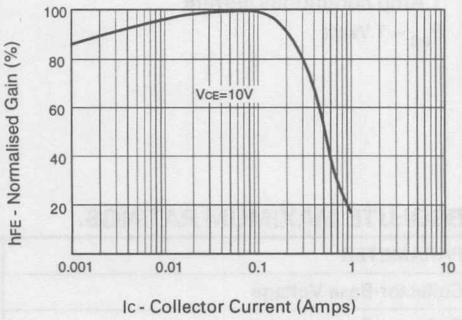
*Measured under pulsed conditions. Pulse width=300µs. Duty cycle ≤ 2%

ZTX452
ZTX453

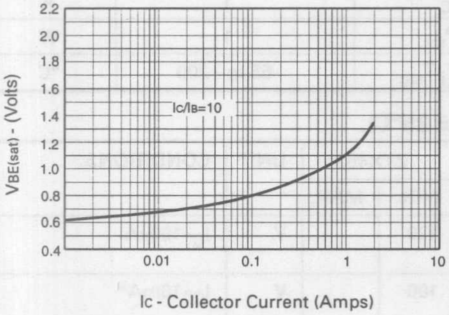
TYPICAL CHARACTERISTICS



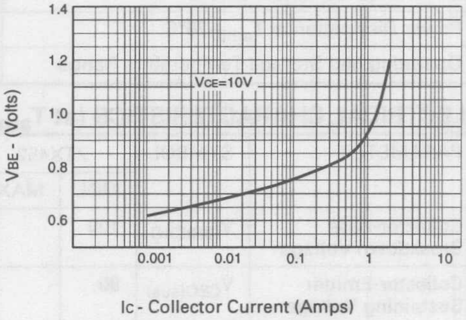
$V_{CE(sat)}$ v I_C



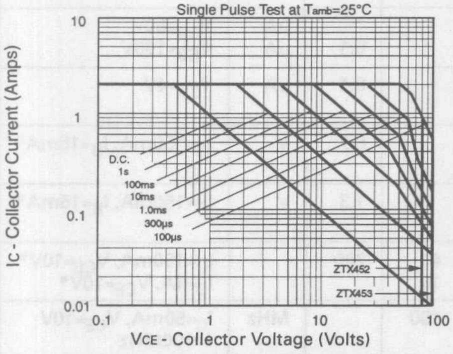
h_{FE} v I_C



$V_{BE(sat)}$ v I_C



$V_{BE(on)}$ v I_C



Safe Operating Area

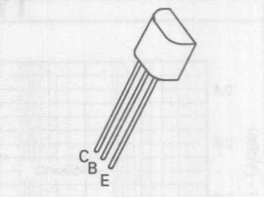
NPN SILICON PLANAR
MEDIUM POWER TRANSISTORS

ZTX454
ZTX455

ISSUE 2 – MARCH 1994

FEATURES

- 140 Volt V_{CEO}
- 1 Amp continuous current
- P_{tot}= 1 Watt



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	ZTX454	ZTX455	UNIT
Collector-Base Voltage	V_{CBO}	140	160	V
Collector-Emitter Voltage	V_{CEO}	120	140	V
Emitter-Base Voltage	V_{EBO}	5		V
Peak Pulse Current	I_{CM}	2		A
Continuous Collector Current	I_C	1		A
Power Dissipation at T_{amb}=25°C	P_{tot}	1		W
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +200		°C

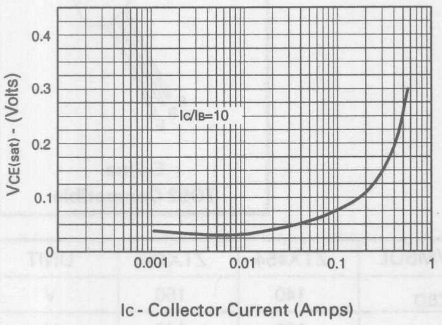
ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C).

PARAMETER	SYMBOL	ZTX454		ZTX455		UNIT	CONDITIONS.
		MIN.	MAX.	MIN.	MAX.		
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	140		160		V	I_C=100µA
Collector-Emitter Sustaining Voltage	$V_{CEO(sus)}$	120		140		V	I_C=10mA*
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	5		5		V	I_E=100µA
Collector Cut-Off Current	I_{CBO}		 0.1		0.1	µA µA	V_{CB}=140V V_{CB}=120V
Emitter Cut-Off Current	I_{EBO}		0.1		0.1	µA	V_{EB}=4V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$		0.7 1.0		0.7	V	I_C=150mA, I_B=15mA I_C=200mA, I_B=20mA
Static Forward Current Transfer Ratio	h_{FE}	100 30 10†	300	100 10†	300		I_C=150mA, V_{CE}=10V* I_C=200mA, V_{CE}=1V* I_C=1A, V_{CE}=10V*
Transition Frequency	f_T	100		100		MHz	I_C=50mA, V_{CE}=10V f=100MHz
Output Capacitance	C_{obo}		15		15	pF	V_{CB}=10V, f=1MHz

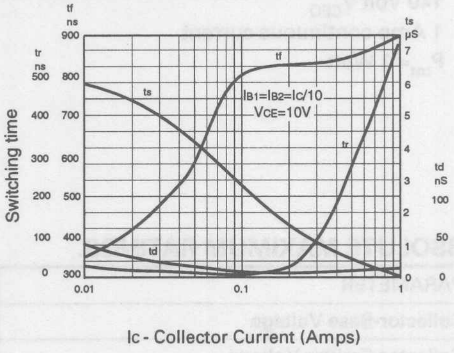
* Measured under pulsed conditions. Pulse width=300µs. Duty cycle ≤ 2%
† Typical

ZTX454
ZTX455

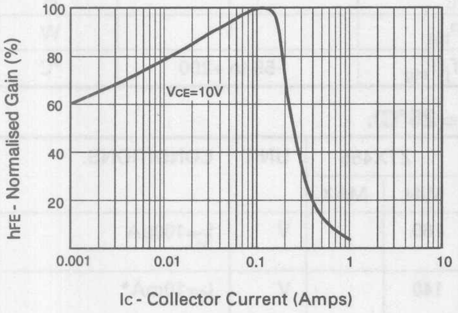
TYPICAL CHARACTERISTICS



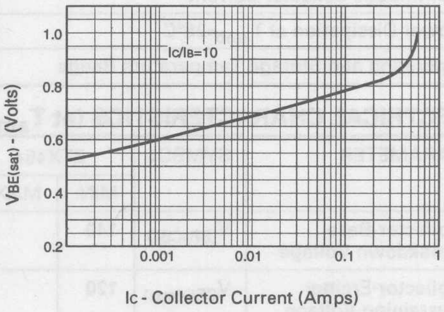
VCE(sat) v IC



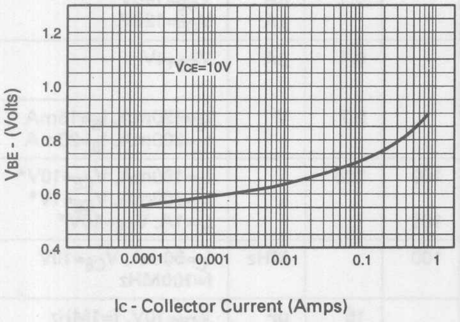
Typical Switching Speeds



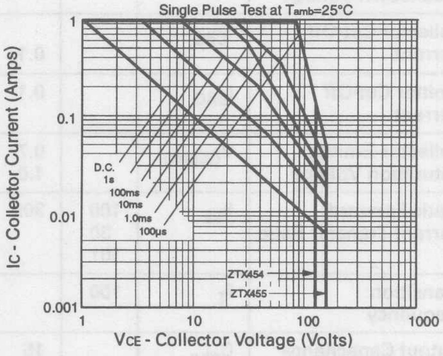
hFE v IC



VBE(sat) v IC



VBE(on) v IC



Safe Operating Area

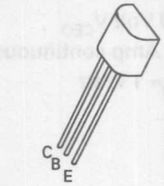
NPN SILICON PLANAR MEDIUM POWER HIGH VOLTAGE TRANSISTOR

ZTX457

ISSUE 2 – MARCH 1994

FEATURES

- 300 Volt V_{CEO}
- 0.5 Amp continuous current
- P_{tot}= 1 Watt



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	300	V
Collector-Emitter Voltage	V_{CEO}	300	V
Emitter-Base Voltage	V_{EBO}	5	V
Peak Pulse Current	I_{CM}	1	A
Continuous Collector Current	I_C	500	mA
Power Dissipation at T_{amb}=25°C	P_{tot}	1	W
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +200	°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	300			V	I_C=100μA, I_E=0
Collector-Emitter Breakdown Voltage	$V_{CEO(sus)}$	300			V	I_C=10mA, I_B=0*
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	5			V	I_E=100μA
Collector Cut-Off Current	I_{CBO}			100 10	nA μA	V_{CB}=200V V_{CB}=200V, T_{amb}=100°C
Emitter Cut-Off Current	I_{EBO}			100	nA	V_{EB}=4V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$			0.3	V	I_C=100mA, I_B=10mA*
Base-Emitter Saturation Voltage	$V_{BE(sat)}$			1	V	I_C=100mA, I_B=10mA*
Base-Emitter Turn On Voltage	$V_{BE(on)}$			1	V	I_C=100mA, V_{CE}=10V*
Static Forward Current Transfer Ratio	h_{FE}	50 50 25		 300 		I_C=10mA, V_{CE}=10V* I_C=50mA, V_{CE}=10V* I_C=100mA, V_{CE}=10V*
Transition Frequency	f_T	75			MHz	I_C=50mA, V_{CE}=10V f=20MHz

*Measured under pulsed conditions. Pulse width=300μs. Duty cycle ≤ 2%

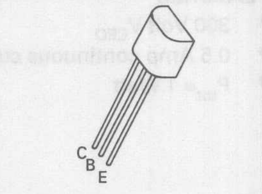
NPN SILICON PLANAR MEDIUM POWER HIGH VOLTAGE TRANSISTOR

ZTX458

ISSUE 2 – MARCH 1994

FEATURES

- 400 Volt V_{CEO}
- 0.5 Amp continuous current
- P_{tot}= 1 Watt



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

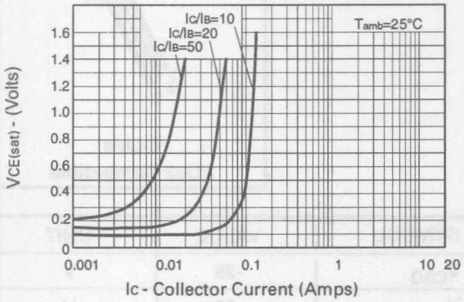
PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	400	V
Collector-Emitter Voltage	V_{CEO}	400	V
Emitter-Base Voltage	V_{EBO}	5	V
Continuous Collector Current	I_C	300	mA
Power Dissipation at T_{amb}=25°C	P_{tot}	1	W
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +200	°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C).

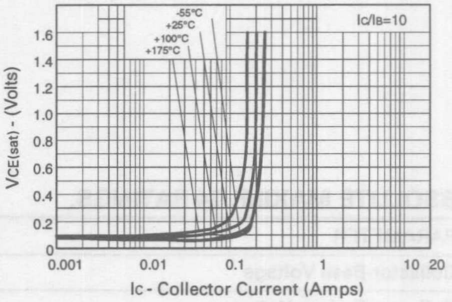
PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	400			V	I_C=100μA
Collector-Emitter Breakdown Voltage	$V_{CEO(sus)}$	400			V	I_C=10mA*
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	5			V	I_E=100μA
Collector Cut-Off Current	I_{CBO}			100	nA	V_{CB}=320V
Collector Cut-Off Current	I_{CES}			100	nA	V_{CE}=320V
Emitter Cut-Off Current	I_{EBO}			100	nA	V_{EB}=4V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$			0.2 0.5	V V	I_C=20mA, I_B=2mA I_C=50mA, I_B=6mA
Base-Emitter Saturation Voltage	$V_{BE(sat)}$			0.9	V	I_C=50mA, I_B=5mA
Base-Emitter Turn On Voltage	$V_{BE(on)}$			0.9	V	I_C=50mA, V_{CE}=10V
Static Forward Current Transfer Ratio	h_{FE}	100 100 15		 300 		I_C=1mA, V_{CE}=10V I_C=50mA, V_{CE}=10V I_C=100mA, V_{CE}=10V*
Transition Frequency	f_T	50			MHz	I_C=10mA, V_{CE}=20V f=20MHz
Collector-Base Breakdown Voltage	C_{obo}			5	pF	V_{CB}=20V, f=1MHz
Switching times	t_{on} t_{off}		135 2260		ns ns	I_C=50mA, V_C=100V I_{B1}=5mA, I_{B2}=-10mA

*Measured under pulsed conditions. Pulse width=300μs. Duty cycle ≤ 2%

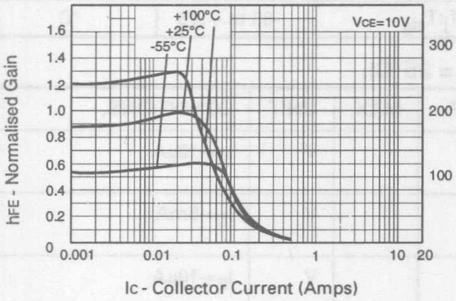
TYPICAL CHARACTERISTICS



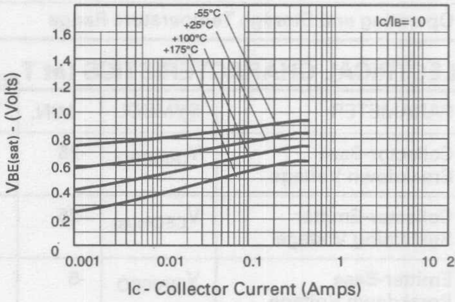
$V_{CE(sat)}$ v I_C



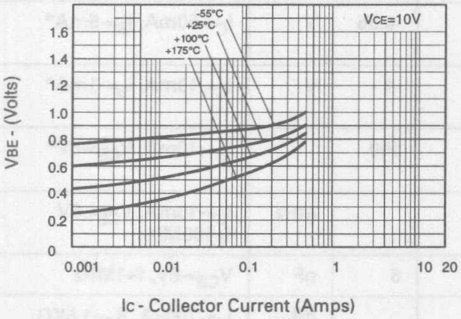
$V_{CE(sat)}$ v I_C



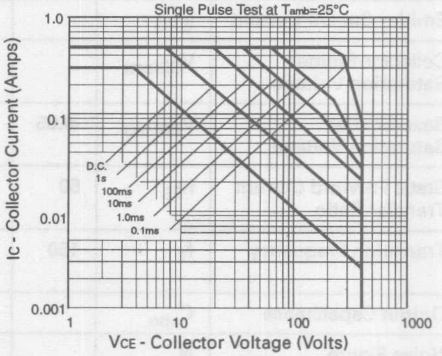
h_{FE} v I_C



$V_{BE(sat)}$ v I_C



$V_{BE(on)}$ v I_C

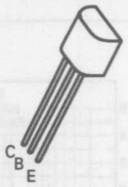


Safe Operating Area

PNP SILICON PLANAR SMALL SIGNAL TRANSISTOR

ISSUE 1 – MARCH 94

ZTX500



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

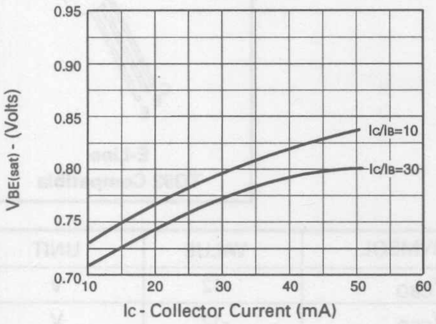
PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	-25	V
Collector-Emitter Voltage	V_{CEO}	-25	V
Emitter-Base Voltage	V_{EBO}	-5	V
Continuous Collector Current	I_C	-500	mA
Power Dissipation at T_{amb}=25°C	P_{tot}	300	mW
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +175	°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C).

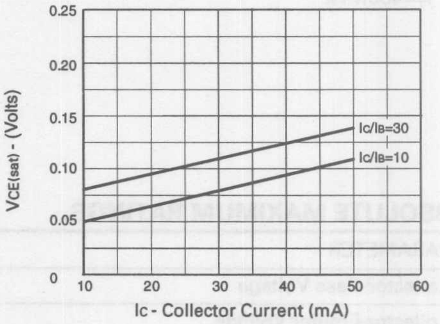
PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	-25			V	I_C=-10µA
Collector-Emitter Sustaining Voltage	$V_{CEO(sus)}$	-25			V	I_C=-5mA
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	-5			V	I_E=-10µA
Collector Cut-Off Current	I_{CBO}			-0.2	µA	V_{CB}=-25V
Emitter Cut-Off Current	I_{EBO}			-0.2	µA	V_{EB}=-4V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$			-0.35	V	I_C=-50mA, I_B=-5mA*
Base-Emitter Saturation Voltage	$V_{BE(sat)}$	-0.65		-1	V	I_C=-10mA, I_B=-1mA*
Static Forward Current Transfer Ratio	h_{FE}	50		300		I_C=-10mA, V_{CE}=-6V*
Transition Frequency	f_T	150			MHz	I_C=-10mA, V_{CE}=-6V f=100MHz
Output Capacitance	C_{obo}			6	pF	V_{CB}=-6V, f=1MHz
Noise Figure	N		7		dB	I_C=-100µA, R_S=1.5KΩ f=1KHz

*Measured under pulsed conditions. Pulse width=300µs. Duty cycle ≤ 2%

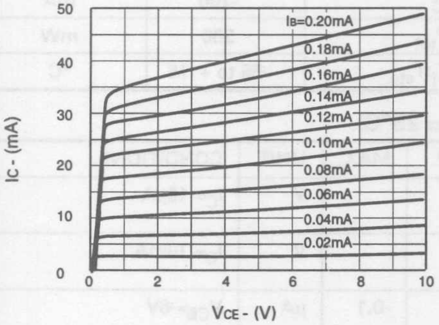
TYPICAL CHARACTERISTICS



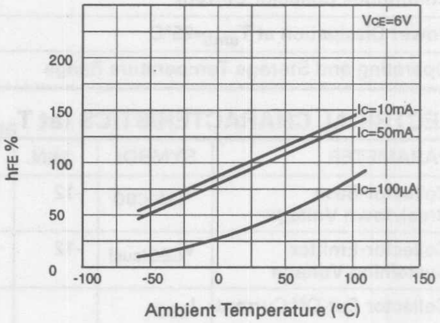
$V_{BE(sat)}$ v I_C



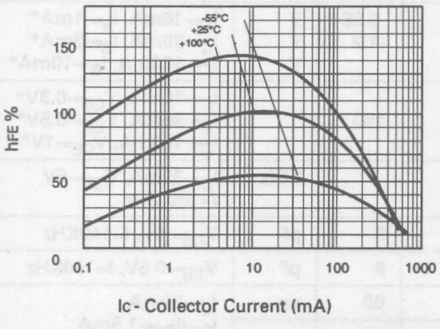
$V_{CE(sat)}$ v I_C



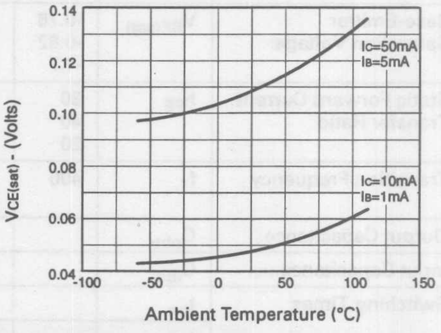
V_{CE} v I_C



h_{FE} v Ambient Temperature



h_{FE} v I_C



$V_{CE(sat)}$ v Ambient Temperature

PNP SILICON PLANAR HIGH SPEED SWITCHING TRANSISTOR

ZTX510

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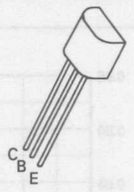
FEATURES

- 12 Volt V_{CEO}
- f_T=400MHz



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	-12	V
Collector-Emitter Voltage	V_{CEO}	-12	V
Emitter-Base Voltage	V_{EBO}	-4	V
Base Current	I_B	-40	mA
Continuous Collector Current	I_C	-200	mA
Power Dissipation at T_{amb}=25°C	P_{tot}	300	mW
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +175	°C

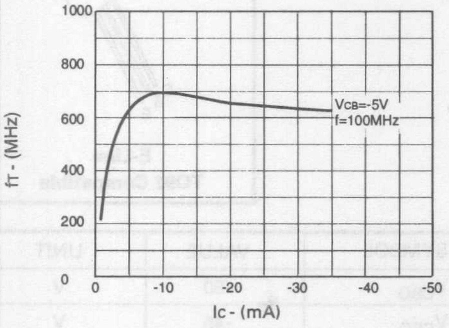
ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C).

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	-12			V	I_C=-10μA
Collector-Emitter Sustaining Voltage	$V_{CEO(sus)}$	-12			V	I_C=-10mA
Collector Cut-Off Current	I_{CBO}			-0.1	μA	V_{CB}=-6V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$			-0.15	V	I_C=-10mA, I_B=-1mA*
				-0.2	V	I_C=-30mA, I_B=-3mA*
				-0.5	V	I_C=-100mA, I_B=-10mA*
Base-Emitter Saturation Voltage	$V_{BE(sat)}$	-0.76		-0.98	V	I_C=-10mA, I_B=-1mA*
		-0.82		-1.2	V	I_C=-30mA, I_B=-3mA*
		-1.7			V	I_C=-100mA, I_B=-10mA*
Static Forward Current Transfer Ratio	h_{FE}	30				I_C=-10mA, V_{CE}=-0.3V*
		40		150		I_C=-30mA, V_{CE}=-0.5V*
		20				I_C=-100mA, V_{CE}=-1V*
Transition Frequency	f_T	400			MHz	I_C=-30mA, V_{CE}=-5V f=100MHz
Output Capacitance	C_{obo}			6	pF	V_{CB}=-5V, f=140KHz
Input Capacitance	C_{ibo}			6	pF	V_{EB}=-0.5V, f=140KHz
Switching Times	t_{on}			60	ns	I_C=-30mA, I_{B1}=I_{B2}=-1.5mA
	t_{off}			90	ns	

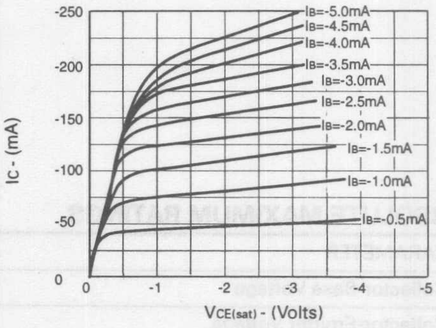
*Measured under pulsed conditions. Pulse width=300μs. Duty cycle ≤ 2%

ZTX510

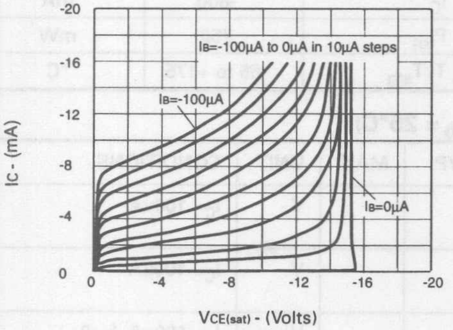
TYPICAL CHARACTERISTICS



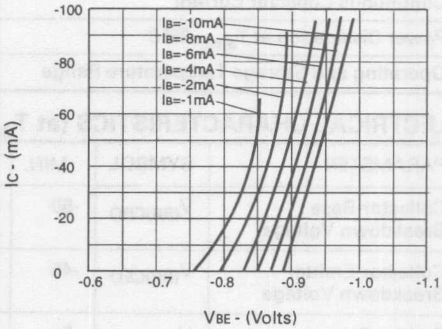
IC v fT



VCE(sat) v IC



VCE v IC

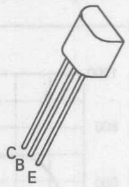


VBE v IC

PNP SILICON PLANAR MEDIUM POWER TRANSISTOR

ISSUE 2 – MARCH 94

ZTX537C



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	-50	V
Collector-Emitter Voltage	V_{CEO}	-45	V
Emitter-Base Voltage	V_{EBO}	-5	V
Peak Pulse Current	I_{CM}	-1	A
Continuous Collector Current	I_C	-800	mA
Power Dissipation at T_{amb}=25°C	P_{tot}	750	mW
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +175	°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C).

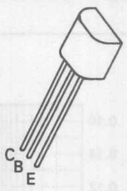
PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	-50			V	I_C=-100µA
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	-45			V	I_C=-100µA
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	-5			V	I_E=-100µA, I_E=0
Collector Cut-Off Current	I_{CBO}			-100	nA	V_{CB}=-45V
Emitter Cut-Off Current	I_{EBO}			-0.2	µA	V_{EB}=-4V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$			-0.7	V	I_C=-500mA, I_B=-50mA*
Base-Emitter Saturation Voltage	$V_{BE(on)}$			-1.2	V	I_C=-300mA, V_{CE}=-1V*
Static Forward Current Transfer Ratio	h_{FE}	250 170		630		I_C=-100mA, V_{CE}=-1V* I_C=-300mA, V_{CE}=-1V*
Transition Frequency	f_T		200		MHz	I_C=-10mA, V_{CE}=-5V f=50MHz
Output Capacitance	Cobo		12		pF	V_{CB}=-10V, f=1MHz

*Measured under pulsed conditions. Pulse width=300µs. Duty cycle ≤ 2%

PNP SILICON PLANAR
SMALL SIGNAL TRANSISTOR

ISSUE 2 – MARCH 94

ZTX541



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	-100	V
Collector-Emitter Voltage	V_{CEO}	-100	V
Emitter-Base Voltage	V_{EBO}	-5	V
Continuous Collector Current	I_C	-100	mA
Power Dissipation at T_{amb}=25°C	P_{tot}	300	mW
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +175	°C

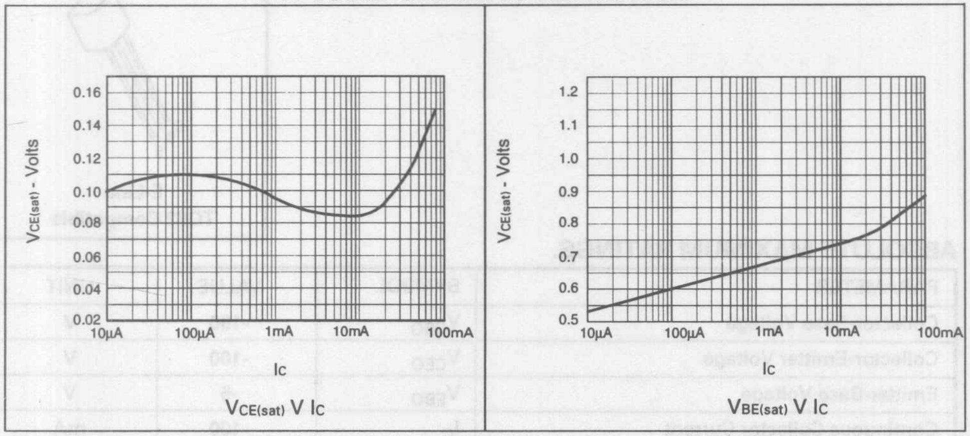
ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C).

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	-100			V	I_C=-100μA
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	-100			V	I_C=-10μA
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	-5			V	I_E=-100μA
Collector Cut-Off Current	I_{CBO}			-0.5	μA	V_{CB}=-80V
Emitter Cut-Off Current	I_{CER}			-0.5 -10	μA μA	V_{CE}=-80V, R_{BE}=50KΩ V_{CE}=-80V, R_{BE}=50KΩ
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$			-0.5	V	I_C=-2mA, I_B=-0.1mA
Base-Emitter Saturation Voltage	$V_{BE(sat)}$			-1.0	V	I_C=-2mA, I_B=-0.1mA
Static Forward Current Transfer Ratio	h_{FE}	30				I_C=-2mA, V_{CE}=-1V
Transition Frequency	f_T	80			MHz	I_C=-5mA, V_{CE}=-5V f=60MHz
Output Capacitance	C_{obo}			10	pF	V_{CB}=-6V, f=1MHz

*Measured under pulsed conditions. Pulse width=300μs. Duty cycle ≤ 2%

ZTX541

TYPICAL CHARACTERISTICS



PNP SILICON PLANAR MEDIUM POWER TRANSISTORS

ZTX549
ZTX549A

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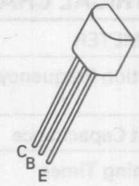
FEATURES

- 30 Volt V_{CEO}
- 1 Amp continuous current
- P_{tot}= 1 Watt



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	-35	V
Collector-Emitter Voltage	V_{CEO}	-30	V
Emitter-Base Voltage	V_{EBO}	-5	V
Peak Pulse Current	I_{CM}	-2	A
Continuous Collector Current	I_C	-1	A
Power Dissipation: at T_{amb}=25°C derate above 25°C	P_{tot}	1 5.7	W mW/ °C
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +200	°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	-35			V	I_C=-100µA
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	-30			V	I_C=-10mA
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	-5			V	I_E=-100µA
Collector Cut-Off Current	I_{CBO}			-0.1 -10	µA µA	V_{CB}=-30V V_{CB}=-30V, T_{amb}=100°C
Emitter Cut-Off Current	I_{EBO}			-0.1	µA	V_{EB}=-4V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$		-0.25 -0.50	-0.50 -0.75	V V	I_C=-1A, I_B=-100mA* I_C=-2A, I_B=-200mA*
ZTX549A				-0.30	V	I_C=-100mA, I_B=-1mA*
Base-Emitter Saturation Voltage	$V_{BE(sat)}$		-0.9	-1.25	V	I_C=-1A, I_B=-100mA*
Base-Emitter Saturation Voltage	$V_{BE(on)}$		-0.85	-1	V	I_C=-1A, V_{CE}=-2V*
Static Forward Current Transfer Ratio	h_{FE}	70 80 40	200 130 80			I_C=-50mA, V_{CE}=-2V* I_C=-1A, V_{CE}=-2V* I_C=-2A, V_{CE}=-2V*
ZTX549		100	160	300		I_C=-500mA, V_{CE}=-2V*
ZTX549A		150	200	500		I_C=-500mA, V_{CE}=-2V*

*Measured under pulsed conditions. Pulse width=300µs. Duty cycle ≤ 2%

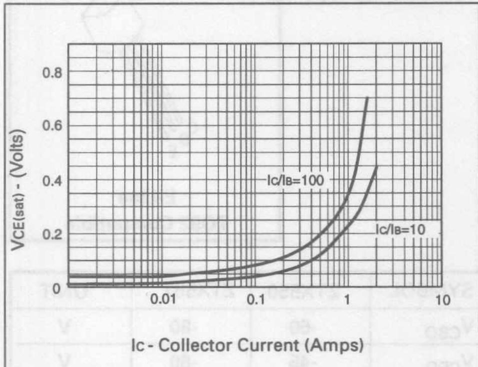
ZTX549
ZTX549A

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C).

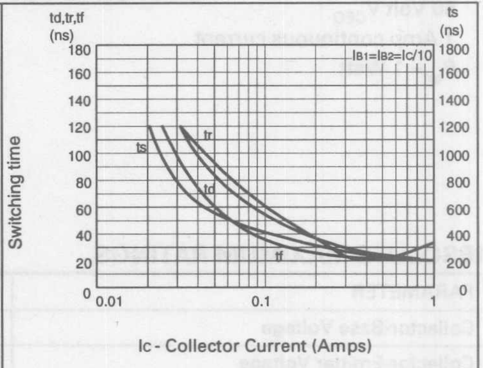
PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Transition Frequency	f_T	100			MHz	I_C=-100mA, V_{CE}=-5V f=100MHz
Output Capacitance	C_{obo}			25	pF	V_{CB}=-10V, f=1MHz
Switching Times	t_{on}		300		ns	I_C=-500mA, V_{CC}=-10V I_{B1}=I_{B2}=-50mA
	t_{off}		50		ns	

ZTX549
ZTX549A

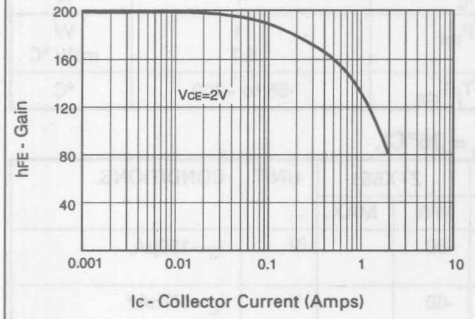
TYPICAL CHARACTERISTICS



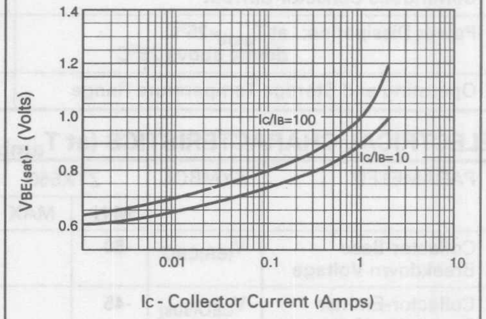
VCE(sat) v IC



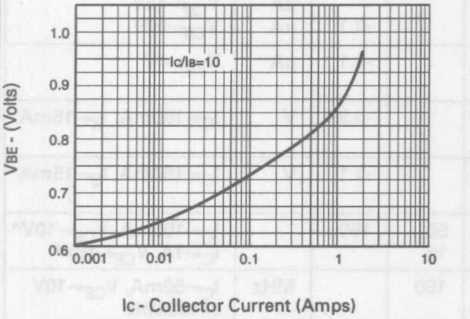
Switching Speeds



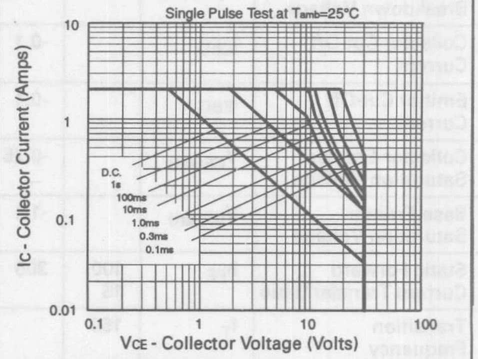
hFE v IC



VBE(sat) v IC



VBE(on) v IC



Safe Operating Area

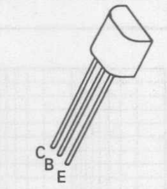
PNP SILICON PLANAR MEDIUM POWER TRANSISTORS

ZTX550 ZTX551

ISSUE 1 – MARCH 94

FEATURES

- 60 Volt V_{CEO}
- 1 Amp continuous current
- P_{tot}= 1 Watt



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

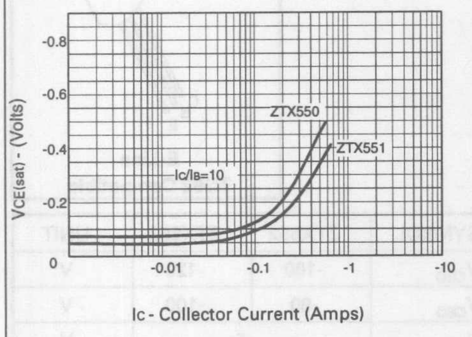
PARAMETER	SYMBOL	ZTX550	ZTX551	UNIT
Collector-Base Voltage	V_{CBO}	-60	-80	V
Collector-Emitter Voltage	V_{CEO}	-45	-60	V
Emitter-Base Voltage	V_{EBO}	-5		V
Peak Pulse Current	I_{CM}	-2		A
Continuous Collector Current	I_C	-1		A
Power Dissipation: at T_{amb}=25°C derate above 25°C	P_{tot}	1 5.7		W mW/ °C
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +200		°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C).

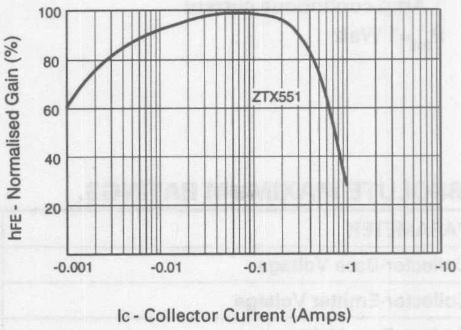
PARAMETER	SYMBOL	ZTX550		ZTX551		UNIT	CONDITIONS.
		MIN.	MAX.	MIN.	MAX.		
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	-60		-80		V	I_C=-100µA
Collector-Emitter Sustaining Voltage	$V_{CEO(sus)}$	-45		-60		V	I_C=-10mA*
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	-5		-5		V	I_E=-100µA
Collector Cut-Off Current	I_{CBO}		-0.1		-0.1	µA µA	V_{CB}=-45V V_{CB}=-60V
Emitter Cut-Off Current	I_{EBO}		-0.1		-0.1	µA	V_{EB}=-4V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$		-0.25		-0.35	V	I_C=-150mA, I_B=-15mA*
Base-Emitter Saturation Voltage	$V_{BE(sat)}$		-1.1		-1.1	V	I_C=-150mA, I_B=-15mA*
Static Forward Current Transfer Ratio	h_{FE}	100 15	300	50 10	150		I_C=-150mA, V_{CE}=-10V* I_C=-1A, V_{CE}=-10V*
Transition Frequency	f_T	150		150		MHz	I_C=-50mA, V_{CE}=-10V f=100MHz
Output Capacitance	C_{obo}		25		25	MHz	V_{CB}=-10V, f=1MHz

*Measured under pulsed conditions. Pulse width=300µs. Duty cycle ≤ 2%

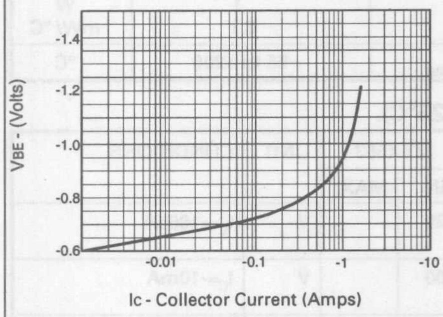
TYPICAL CHARACTERISTICS



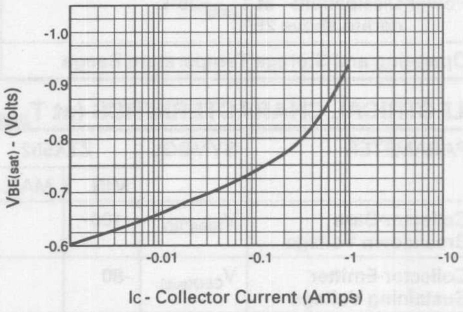
$V_{CE(sat)}$ v I_C



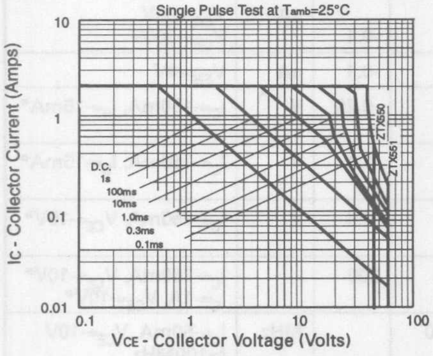
h_{FE} v I_C



$V_{BE(on)}$ v I_C



$V_{BE(sat)}$ v I_C



Safe Operating Area

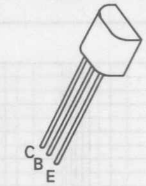
PNP SILICON PLANAR MEDIUM POWER TRANSISTORS

ZTX552 ZTX553

ISSUE 1 – MARCH 94

FEATURES

- 100 Volt V_{CEO}
- 1 Amp continuous current
- P_{tot}=1 Watt



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	ZTX552	ZTX553	UNIT
Collector-Base Voltage	V_{CBO}	-100	-120	V
Collector-Emitter Voltage	V_{CEO}	-80	-100	V
Emitter-Base Voltage	V_{EBO}	-5		V
Peak Pulse Current	I_{CM}	-2		A
Continuous Collector Current	I_C	-1		A
Power Dissipation: at T_{amb}=25°C derate above 25°C	P_{tot}	1 5.7		W mW/ °C
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +200		°C

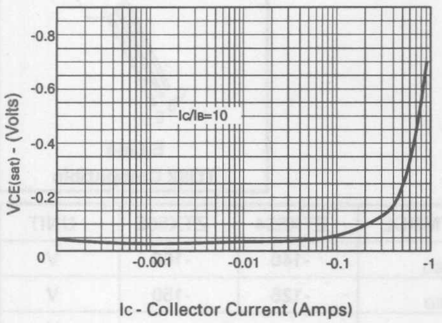
ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C).

PARAMETER	SYMBOL	ZTX552		ZTX553		UNIT	CONDITIONS.
		MIN.	MAX.	MIN.	MAX.		
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	-100		-120		V	I_C=-100μA
Collector-Emitter Sustaining Voltage	$V_{CEO(sus)}$	-80		-100		V	I_C=-10mA
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	-5		-5		V	I_E=-100μA
Collector Cut-Off Current	I_{CBO}		-0.1		-0.1	μA	V_{CB}=-80V V_{CB}=-100V
Emitter Cut-Off Current	I_{EBO}		-0.1		-0.1	μA	V_{EB}=-4V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$		-0.25		-0.25	V	I_C=-150mA, I_B=-15mA*
Base-Emitter Saturation Voltage	$V_{BE(sat)}$		-1.1		-1.1	V	I_C=-150mA, I_B=-15mA*
Base-Emitter Turn-onn Voltage	$V_{BE(on)}$		-1.0		-1.0	V	I_C=-150mA, V_{CE}=-10V*
Static Forward Current Transfer Ratio	h_{FE}	40 10	150	40 10	200		I_C=-150mA, V_{CE}=-10V* I_C=-1A, V_{CE}=-10V*
Transition Frequency	f_T	150		150		MHz	I_C=-50mA, V_{CE}=-10V f=100MHz
Output Capacitance	C_{obo}		12		12	MHz	V_{CB}=-10V, f=1MHz

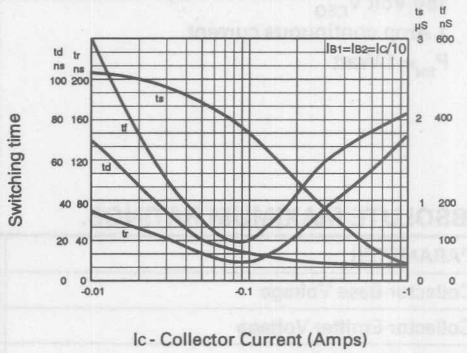
*Measured under pulsed conditions. Pulse width=300μs. Duty cycle ≤2%

ZTX552
ZTX553

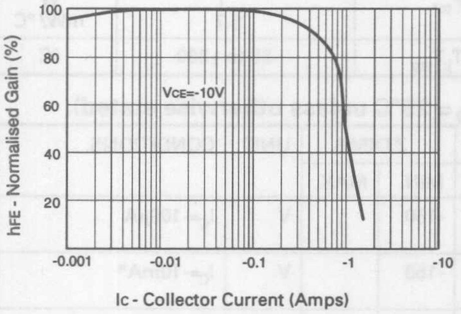
TYPICAL CHARACTERISTICS



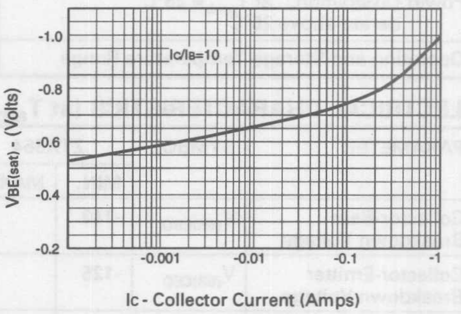
VCE(sat) v IC



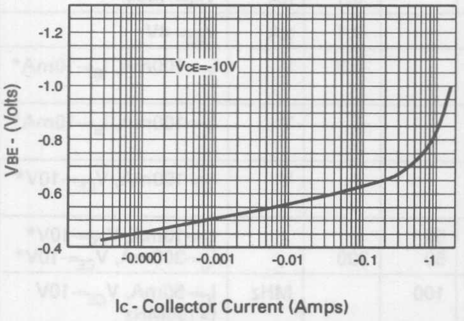
Switching Speeds



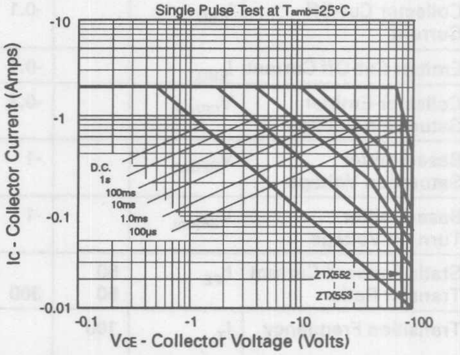
hFE v IC



VBE(sat) v IC



VBE(on) v IC



Safe Operating Area

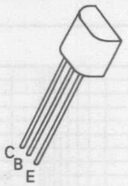
PNP SILICON PLANAR MEDIUM POWER TRANSISTORS

ISSUE 1 – MARCH 94

ZTX554
ZTX555

FEATURES

- 150 Volt V_{CEO}
- 1 Amp continuous current
- P_{tot}= 1 Watt



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	ZTX554	ZTX555	UNIT
Collector-Base Voltage	V_{CBO}	-140	-160	V
Collector-Emitter Voltage	V_{CEO}	-125	-150	V
Emitter-Base Voltage	V_{EBO}	-5		V
Peak Pulse Current	I_{CM}	-2		A
Continuous Collector Current	I_C	-1		A
Power Dissipation: at T_{amb} = 25°C derate above 25°C	P_{tot}	1 5.7		W mW/ °C
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +200		°C

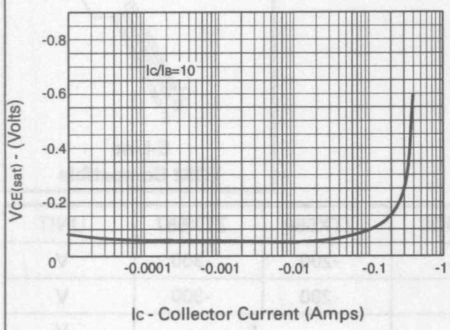
ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

PARAMETER	SYMBOL	ZTX554		ZTX555		UNIT	CONDITIONS.
		MIN.	MAX	MIN.	MAX		
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	-140		-160		V	I_C=-100µA
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	-125		-150		V	I_C=-10mA*
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	-5		-5		V	I_E=-100µA
Collector Cut-Off Current	I_{CBO}		-0.1		-0.1	µA µA	V_{CB}=-120V V_{CB}=-140V
Emitter Cut-Off Current	I_{EBO}		-0.1		-0.1	µA	V_{EB}=-4V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$		-0.3		-0.3	V	I_C=-100mA, I_B=-10mA*
Base-Emitter Saturation Voltage	$V_{BE(sat)}$		-1		-1	V	I_C=-100mA, I_B=-10mA*
Base-Emitter Turn-on Voltage	$V_{BE(on)}$		-1		-1	V	I_C=-100mA, V_{CE}=-10V*
Static Forward Current Transfer Ratio	h_{FE}	50 50	 300	50 50	 300		I_C=-10mA, V_{CE}=-10V* I_C=-300mA, V_{CE}=-10V*
Transition Frequency	f_T	100		100		MHz	I_C=-50mA, V_{CE}=-10V f=100MHz
Output Capacitance	C_{obo}		10		10	pF	V_{CB}=-10V, f=1MHz

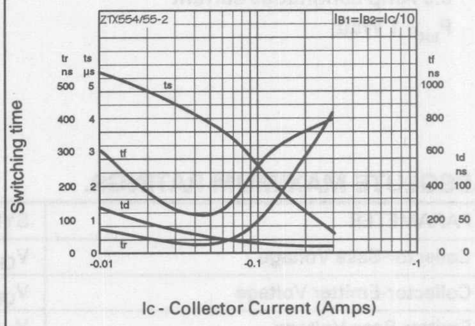
* Measured under pulsed conditions. Pulse width=300µs. Duty cycle ≤2%

ZTX554
ZTX555

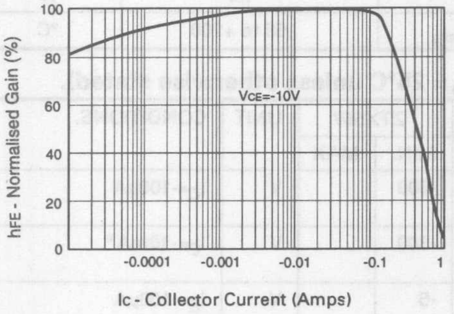
TYPICAL CHARACTERISTICS



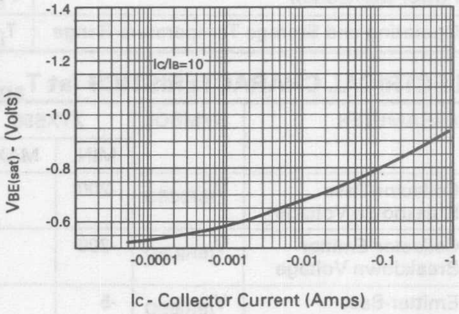
VCE(sat) v IC



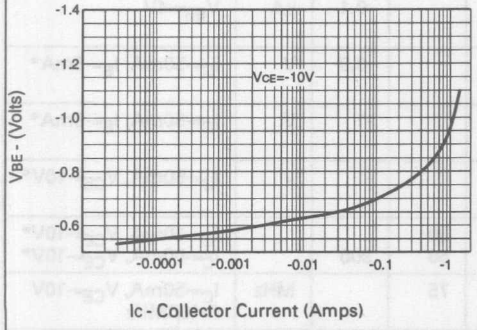
Switching Speeds



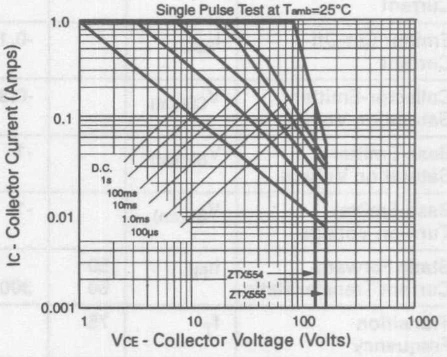
hFE v IC



VBE(sat) v IC



VBE(on) v IC



Safe Operating Area

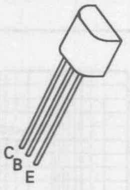
PNP SILICON PLANAR MEDIUM POWER HIGH VOLTAGE TRANSISTORS

ISSUE 1 – JULY 94

ZTX556
ZTX557

FEATURES

- 300 Volt V_{CEO}
- 0.5 Amp continuous current
- P_{tot}= 1 Watt



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	ZTX556	ZTX557	UNIT
Collector-Base Voltage	V_{CBO}	-200	-300	V
Collector-Emitter Voltage	V_{CEO}	-200	-300	V
Emitter-Base Voltage	V_{EBO}	-5		V
Peak Pulse Current	I_{CM}	-1		A
Continuous Collector Current	I_C	-0.5		A
Power Dissipation	P_{tot}	1.0		W
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +200		°C

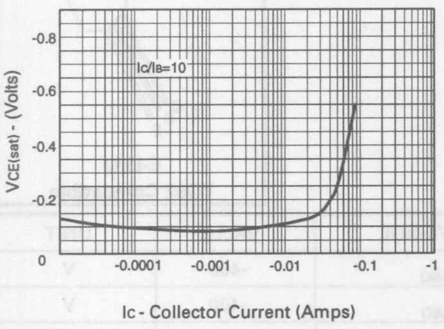
ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

PARAMETER	SYMBOL	ZTX556		ZTX557		UNIT	CONDITIONS.
		MIN.	MAX	MIN.	MAX		
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	-200		-300		V	I_C=-100µA
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	-200		-300		V	I_C=-10mA*
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	-5		-5		V	I_E=-100µA
Collector Cut-Off Current	I_{CBO}		-0.1		 -0.1	µA µA	V_{CB}=-160V V_{CB}=-200V
Emitter Cut-Off Current	I_{EBO}		-0.1		-0.1	µA	V_{EB}=-4V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$		-0.3		-0.3	V	I_C=-50mA, I_B=-5mA*
Base-Emitter Saturation Voltage	$V_{BE(sat)}$		-1		-1	V	I_C=-50mA, I_B=-5mA*
Base-Emitter Turn-on Voltage	$V_{BE(on)}$		-1		-1	V	I_C=-50mA, V_{CE}=-10V*
Static Forward Current Transfer Ratio	h_{FE}	50 50	 300	50 50	 300		I_C=-10mA, V_{CE}=-10V* I_C=-50mA, V_{CE}=-10V*
Transition Frequency	f_T	75		75		MHz	I_C=-50mA, V_{CE}=-10V f=100MHz
Output Capacitance	C_{obo}		10		10	pF	V_{CE}=-10V, f=1MHz

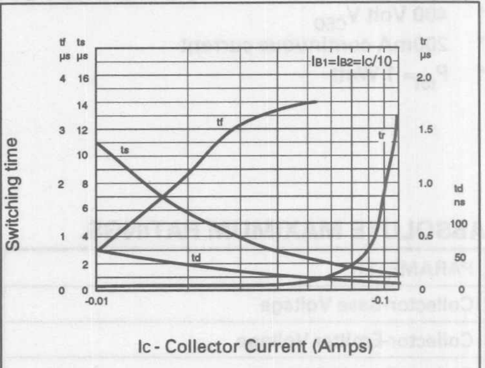
* Measured under pulsed conditions. Pulse width=300µs. Duty cycle ≤2%

ZTX556
ZTX557

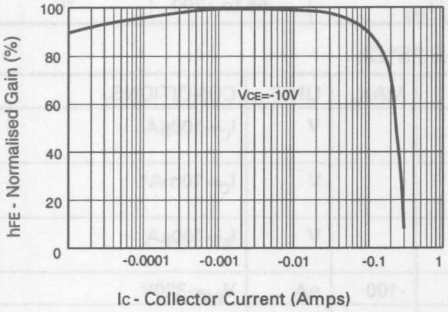
TYPICAL CHARACTERISTICS



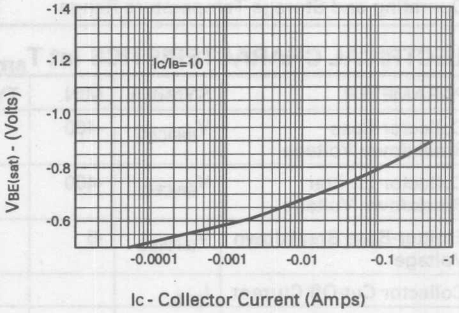
VCE(sat) v IC



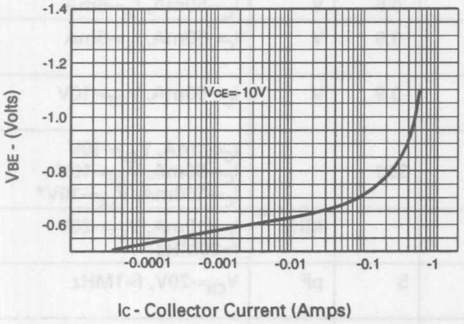
Switching Speeds



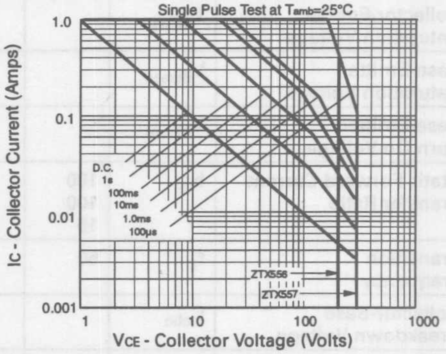
hFE v IC



VBE(sat) v IC



VBE(on) v IC



Safe Operating Area

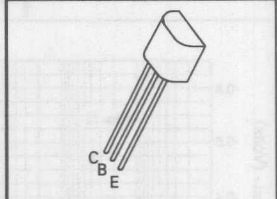
PNP SILICON PLANAR MEDIUM POWER HIGH VOLTAGE TRANSISTOR

ZTX558

ISSUE 1 – APRIL 94

FEATURES

- 400 Volt V_{CEO}
- 200mA continuous current
- P_{tot}= 1 Watt



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

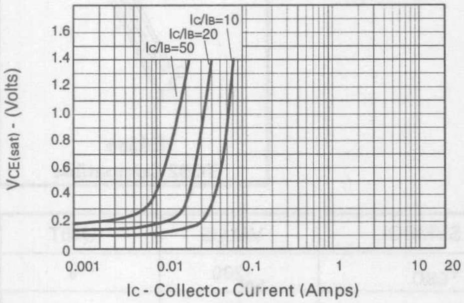
PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	-400	V
Collector-Emitter Voltage	V_{CEO}	-400	V
Emitter-Base Voltage	V_{EBO}	-5	V
Continuous Collector Current	I_C	-200	mA
Power Dissipation	P_{tot}	1	W
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +200	°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C).

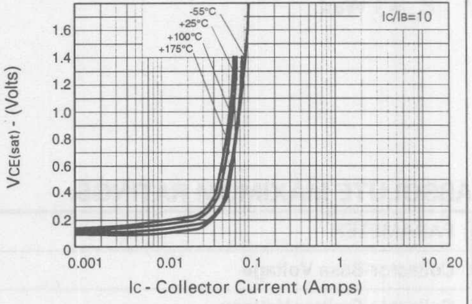
PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	-400			V	I_C=-100μA
Collector-Emitter Breakdown Voltage	$V_{BR(CEO)}$	-400			V	I_C=-10mA*
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	-5			V	I_E=-100μA
Collector Cut-Off Current	I_{CBO}			-100	nA	V_{CB}=-320V
Collector Cut-Off Current	I_{CES}			-100	nA	V_{CE}=-320V
Emitter Cut-Off Current	I_{EBO}			-100	nA	V_{EB}=-4V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$			-0.2 -0.5	V V	I_C=-20mA, I_B=-2mA I_C=-50mA, I_B=-6mA
Base-Emitter Saturation Voltage	$V_{BE(sat)}$			-0.9	V	I_C=-50mA, I_B=-5mA
Base-Emitter Turn On Voltage	$V_{BE(on)}$			-0.9	V	I_C=-50mA, V_{CE}=-10V
Static Forward Current Transfer Ratio	h_{FE}	100 100 15		 300 		I_C=-1mA, V_{CE}=-10V I_C=-50mA, V_{CE}=-10V I_C=-100mA, V_{CE}=-10V*
Transition Frequency	f_T	50			MHz	I_C=-10mA, V_{CE}=-20V f=20MHz
Collector-Base Breakdown Voltage	C_{obo}			5	pF	V_{CB}=-20V, f=1MHz
Switching times	t_{on} t_{off}		95 1600		ns ns	I_C=-50mA, V_C=-100V I_{B1}=5mA, I_{B2}=-10mA

* Measured under pulsed conditions. Pulse width=300μs. Duty cycle ≤2%

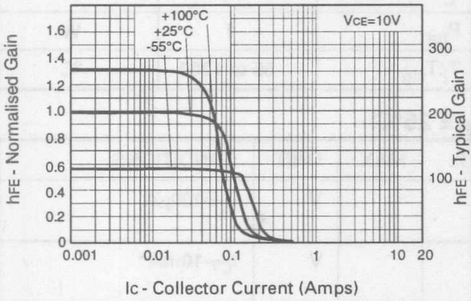
TYPICAL CHARACTERISTICS



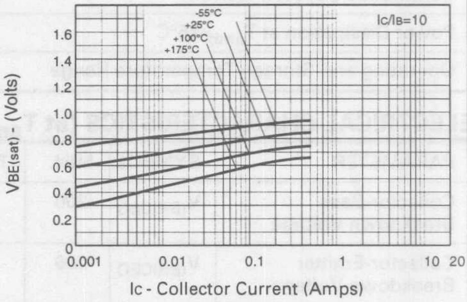
VCE(sat) v IC



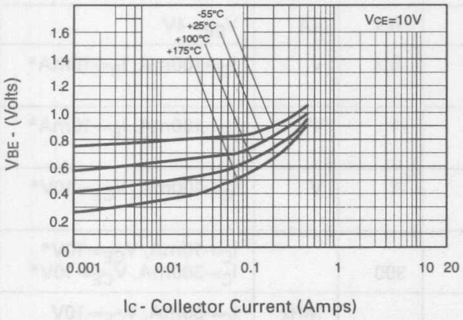
VCE(sat) v IC



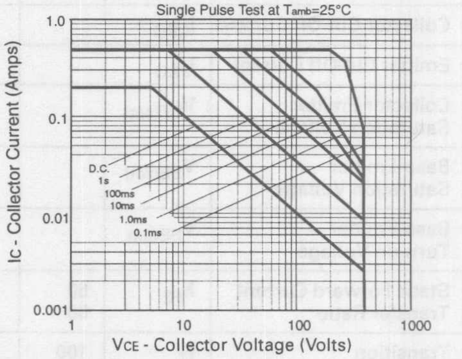
hFE v IC



VBE(sat) v IC



VBE(on) v IC



Safe Operating Area

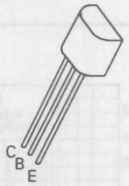
PNP SILICON PLANAR MEDIUM POWER HIGH VOLTAGE TRANSISTOR

ZTX576

ISSUE 1 – APRIL 94

FEATURES

- 200 Volt V_{CEO}
- 1 Amp continuous current
- P_{tot}= 1 Watt



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

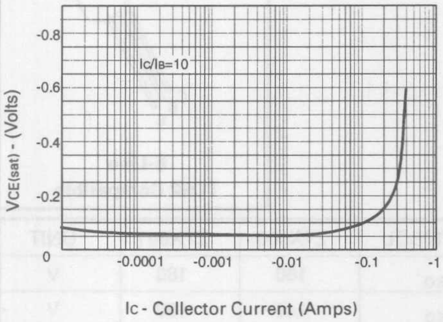
PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	-200	V
Collector-Emitter Voltage	V_{CEO}	-200	V
Emitter-Base Voltage	V_{EBO}	-5	V
Peak Pulse Current	I_{CM}	-2	A
Continuous Collector Current	I_C	-1	A
Power Dissipation at T_{amb}=25°C	P_{tot}	1	W
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +200	°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C).

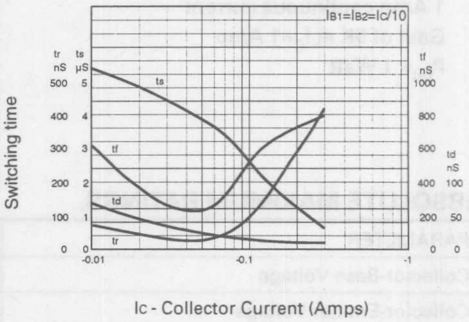
PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	-200			V	I_C=-100μA
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	-200			V	I_C=-10mA*
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	-5			V	I_E=-100μA
Collector Cut-Off Current	I_{CBO}			-0.1	μA	V_{CB}=-160V
Emitter Cut-Off Current	I_{EBO}			-0.1	μA	V_{EB}=-4V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$			-0.3	V	I_C=-100mA, I_B=-10mA*
Base-Emitter Saturation Voltage	$V_{BE(sat)}$			-1	V	I_C=-100mA, I_B=-10mA*
Base-Emitter Turn-on Voltage	$V_{BE(on)}$			-1	V	I_C=-100mA, V_{CE}=-10V*
Static Forward Current Transfer Ratio	h_{FE}	50				I_C=-10mA, V_{CE}=-10V*
		50		300		I_C=-300mA, V_{CE}=-10V*
Transition Frequency	f_T	100			MHz	I_C=-50mA, V_{CE}=-10V f=100MHz

*Measured under pulsed conditions. Pulse width=300μs. Duty cycle ≤ 2%

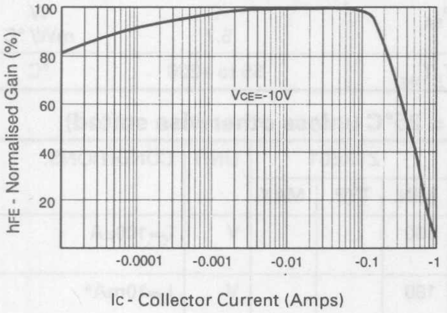
TYPICAL CHARACTERISTICS



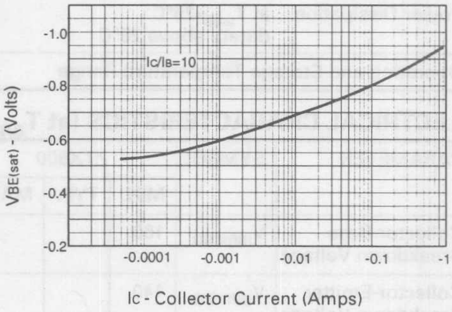
VCE(sat) v IC



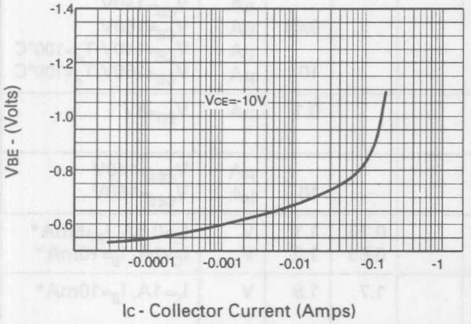
Typical Switching Speeds



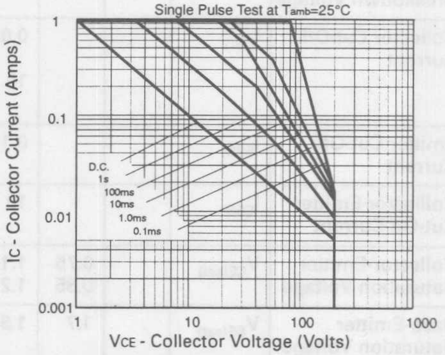
hFE v IC



VBE(sat) v IC



VBE(on) v IC



Safe Operating Area

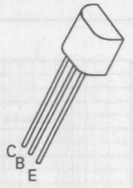
NPN SILICON PLANAR MEDIUM POWER DARLINGTON TRANSISTORS

ZTX600
ZTX601

ISSUE 2 – JUNE 94

FEATURES

- 160 Volt V_{CEO}
- 1 Amp continuous current
- Gain of 5K at I_C=1 Amp
- P_{tot}= 1 Watt



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	ZTX600	ZTX601	UNIT
Collector-Base Voltage	V_{CBO}	160	180	V
Collector-Emitter Voltage	V_{CEO}	140	160	V
Emitter-Base Voltage	V_{EBO}	10		V
Peak Pulse Current	I_{CM}	4		A
Continuous Collector Current	I_C	1		A
Power Dissipation at T_{amb}=25°C derate above 25°C	P_{tot}	1 5.7		W mW/ °C
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +200		°C

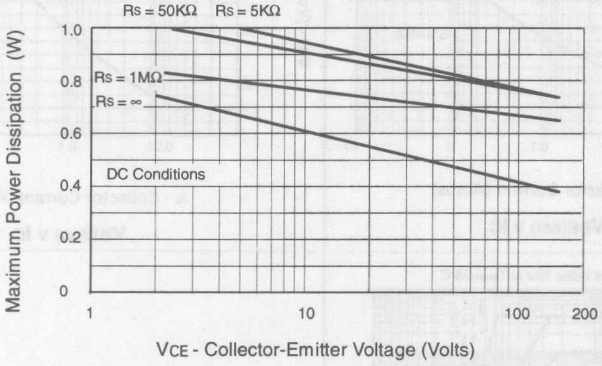
ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

PARAMETER	SYMBOL	ZTX600			ZTX601			UNIT	CONDITIONS.
		MIN.	TYP.	MAX.	MIN.	TYP.	MAX.		
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	160			180			V	I_C=100μA
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	140			160			V	I_C=10mA*
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	10			10			V	I_E=100μA
Collector Cut-Off Current	I_{CBO}			0.01				μA	V_{CB}=140V
							0.01	μA	V_{CB}=160V
				10				μA	V_{CB}=140V,T_a=100°C
							10	μA	V_{CB}=160V,T_a=100°C
Emitter Cut-Off Current	I_{EBO}			0.1			0.1	μA	V_{EB}=8V
Colllector-Emitter Cut-Off Current	I_{CES}			10				μA	V_{CES}=140V
							10	μA	V_{CES}=160V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$		0.75	1.1		0.75	1.1	V	I_C=0.5A, I_B=5mA*
			0.85	1.2		0.85	1.2	V	I_C=1A, I_B=10mA*
Base-Emitter Saturation Voltage	$V_{BE(sat)}$		1.7	1.9		1.7	1.9	V	I_C=1A, I_B=10mA*
Base-Emitter Turn-On Voltage	$V_{BE(on)}$		1.5	1.7		1.5	1.7	V	I_C=1A, V_{CE}=5V*

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

PARAMETER	SYMBOL	ZTX600			ZTX601			UNIT	CONDITIONS.
		MIN.	TYP.	MAX.	MIN.	TYP.	MAX.		
Static Forward Current Transfer Ratio	h_{FE}	1K 2K 1K		100K	1K 2K 1K		100K		I_C=50mA, V_{CE}=10V* I_C=0.5A, V_{CE}=10V* I_C=1A, V_{CE}=10V*
Group A		1K 2K 1K	2K 5K 3K	20K	1K 2K 1K	2K 5K 3K	20K		I_C=50mA, V_{CE}=10V* I_C=0.5A, V_{CE}=10V* I_C=1A, V_{CE}=10V*
Group B		5K 10K 5K	10K 20K 10K	100K	5K 10K 5K	10K 20K 10K	100K		I_C=50mA, V_{CE}=10V* I_C=0.5A, V_{CE}=10V* I_C=1A, V_{CE}=10V*
Transition Frequency	f_T	150	250		150	250		MHz	I_C=100mA, V_{CE}=10V f=20MHz
Input Capacitance	C_{ibo}		60	90		60	90	pF	V_{EB}=0.5V, f=1MHz
Output Capacitance	C_{obo}		10	15		10	15	pF	V_{CE}=10V, f=1MHz
Switching Times	t_{on}		0.75			0.75		µs	I_C=0.5A, V_{CE}=10V I_{B1}=I_{B2}=0.5mA
	t_{off}		2.2			2.2		µs	

*Measured under pulsed conditions. Pulse width=300µs. Duty cycle ≤2%



Voltage Derating Graph

The maximum permissible operational temperature can be obtained from this graph using the following equation

$$T_{amb(max)} = \frac{Power(max) - Power(act)}{0.0057} + 25^\circ C$$

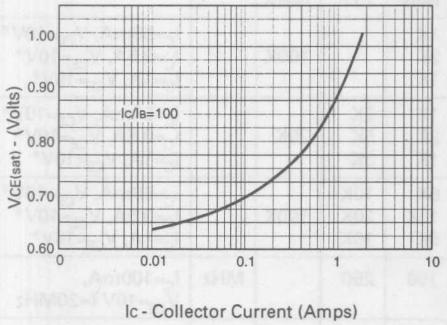
$T_{amb(max)}$= Maximum operating ambient temperature

Power(max) = Maximum power dissipation figure, obtained from the above graph for a given V_{CE} and source resistance (R_S)

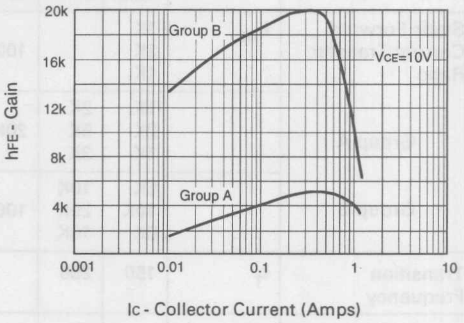
Power(actual)= Actual power dissipation in users circuit

ZTX600
ZTX601

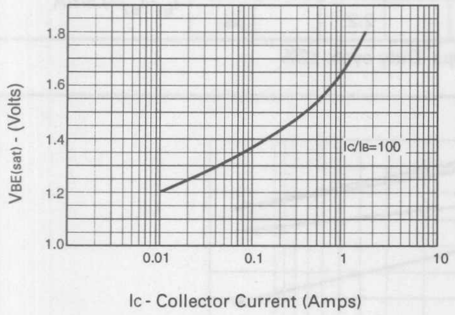
TYPICAL CHARACTERISTICS



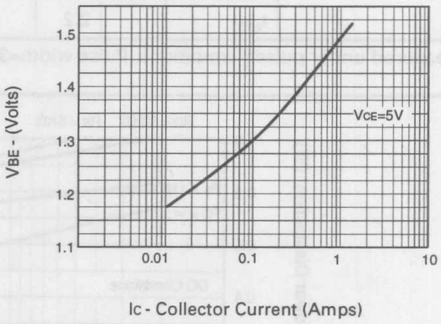
VCE(sat) v IC



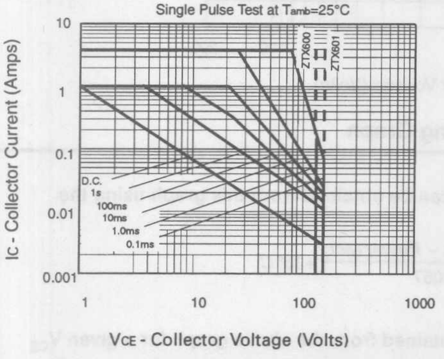
hFE v IC



VBE(sat) v IC



VBE(on) v IC



Safe Operating Area

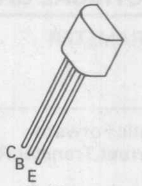
NPN SILICON PLANAR MEDIUM POWER DARLINGTON TRANSISTORS

ZTX602
ZTX603

ISSUE 1 – MARCH 94

FEATURES

- 80 Volt V_{CEO}
- 1 Amp continuous current
- Gain of 2K at I_C=1 Amp
- P_{tot}= 1 Watt



E-Line

TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER		SYMBOL	ZTX602	ZTX603	UNIT
Collector-Base Voltage		V_{CBO}	80	100	V
Collector-Emitter Voltage		V_{CEO}	60	80	V
Emitter-Base Voltage		V_{EBO}	10		V
Peak Pulse Current		I_{CM}	4		A
Continuous Collector Current		I_C	1		A
Power Dissipation	at T_{amb}= 25°C	P_{tot}	1		W
	derate above 25°C		5.7		mW/ °C
Operating and Storage Temperature Range		T_j:T_{stg}	-55 to +200		°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

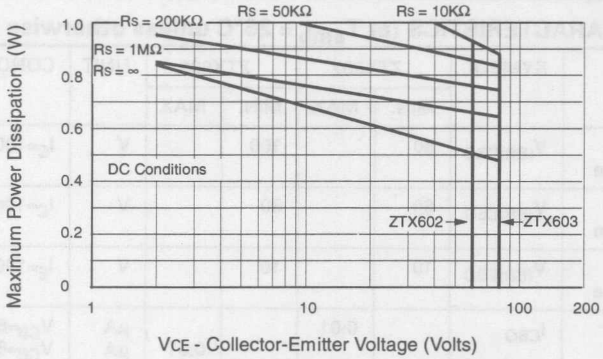
PARAMETER	SYMBOL	ZTX602		ZTX603		UNIT	CONDITIONS.
		MIN.	MAX.	MIN.	MAX.		
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	80		100		V	I_C=100μA
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	60		80		V	I_C=10mA*
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	10		10		V	I_E=100μA
Collector Cut-Off Current	I_{CBO}		0.01			μA	V_{CB}=60V
					0.01	μA	V_{CB}=80V
			10			μA	V_{CB}=60V,T_{amb}=100°C
					10	μA	V_{CB}=80V,T_{amb}=100°C
Emitter Cut-Off Current	I_{EBO}		0.1		0.1	μA	V_{EB}=8V
Colllector-Emitter Cut-Off Current	I_{CES}		10			μA	V_{CES}=60V
					10	μA	V_{CES}=80V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$		1.0		1.0	V	I_C=400mA, I_B=0.4mA*
			1.0		1.0	V	I_C=1A, I_B=1mA*
Base-Emitter Saturation Voltage	$V_{BE(sat)}$		1.8		1.8	V	I_C=1A, I_B=1mA*
Base-Emitter Turn-On Voltage	$V_{BE(on)}$		1.7		1.7	V	I_C=1A, V_{CE}=5V*

ZTX602
ZTX603

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

PARAMETER	SYMBOL	ZTX602		ZTX603		UNIT	CONDITIONS.
		MIN.	MAX.	MIN.	MAX.		
Static Forward Current Transfer Ratio	h_{FE}	2K 5K 2K 0.5K	 100K 	2K 5K 2K 0.5K	 100K 		I_C=50mA, V_{CE}=5V I_C=500mA, V_{CE}=5V* I_C=1A, V_{CE}=5V* I_C=2A, V_{CE}=5V*
Transition Frequency	f_T	150		150		MHz	I_C=100mA, V_{CE}=10V f=20MHz
Input Capacitance	C_{ibo}	90 Typical				pF	V_{EB}=500mV, f=1MHz
Output Capacitance	C_{obo}	15 Typical				pF	V_{CB}=10V, f=1MHz
Switching Times	t_{on}	0.5 Typical				µs	I_C=500mA, V_{CE}=10V I_{B1}=I_{B2}=0.5mA
	t_{off}	1.1 Typical				µs	

*Measured under pulsed conditions. Pulse width=300µs. Duty cycle ≤2%



Voltage Derating Graph

The maximum permissible operational temperature can be obtained from this graph using the following equation

$$T_{amb\,(max)} = \frac{Power\,(max) - Power\,(act)}{0.0057} + 25^\circ C$$

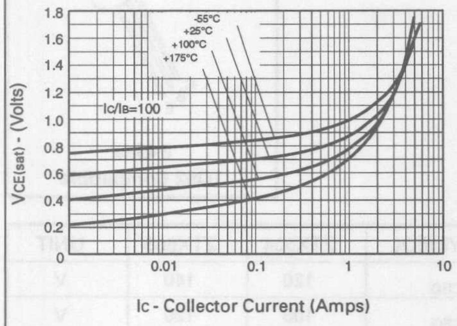
$T_{amb(max)}$= Maximum operating ambient temperature

Power(max) = Maximum power dissipation figure, obtained from the above graph for a given V_{CE} and source resistance (R_S)

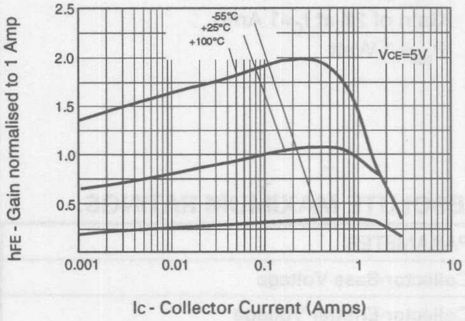
Power(actual)= Actual power dissipation in users circuit

ZTX602
ZTX603

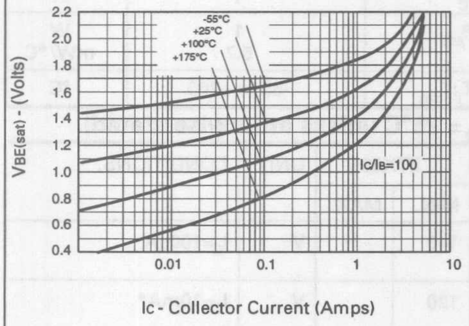
TYPICAL CHARACTERISTICS



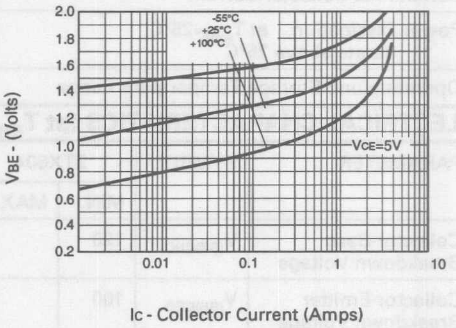
$V_{CE(sat)}$ v I_C



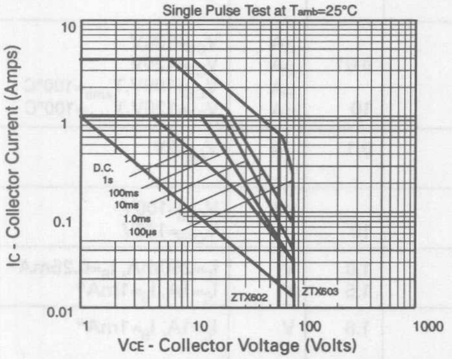
h_{FE} v I_C



$V_{BE(sat)}$ v I_C



$V_{BE(on)}$ v I_C



Safe Operating Area

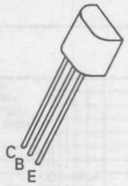
NPN SILICON PLANAR MEDIUM POWER DARLINGTON TRANSISTORS

ZTX604
ZTX605

ISSUE 1 – MARCH 94

FEATURES

- 120 Volt V_{CEO}
- 1 Amp continuous current
- Gain of 2K at I_C=1 Amp
- P_{tot}= 1 Watt



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	ZTX604	ZTX605	UNIT
Collector-Base Voltage	V_{CBO}	120	140	V
Collector-Emitter Voltage	V_{CEO}	100	120	V
Emitter-Base Voltage	V_{EBO}	10		V
Peak Pulse Current	I_{CM}	4		A
Continuous Collector Current	I_C	1		A
Power Dissipation at T_{amb}=25°C derate above 25°C	P_{tot}	1 5.7		W mW/ °C
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +200		°C

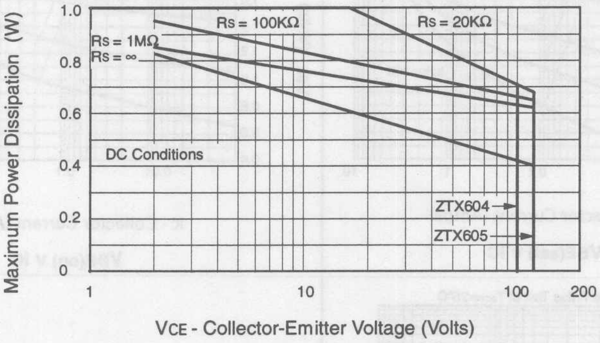
ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

PARAMETER	SYMBOL	ZTX604		ZTX605		UNIT	CONDITIONS.
		MIN.	MAX.	MIN.	MAX.		
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	120		140		V	I_C=100µA
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	100		120		V	I_C=10mA*
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	10		10		V	I_E=100µA
Collector Cut-Off Current	I_{CBO}		0.01			µA	V_{CB}=100V
					0.01	µA	V_{CB}=120V
			10			µA	V_{CB}=100V,T_{amb}=100°C
					10	µA	V_{CB}=120V,T_{amb}=100°C
Emitter Cut-Off Current	I_{EBO}		0.1		0.1	µA	V_{EB}=8V
Colllector-Emitter Cut-Off Current	I_{CES}		10			µA	V_{CES}=100V
					10		V_{CES}=120V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$		1.0		1.0	V	I_C=250mA, I_B=0.25mA*
			1.5		1.5	V	I_C=1A, I_B=1mA*
Base-Emitter Saturation Voltage	$V_{BE(sat)}$		1.8		1.8	V	I_C=1A, I_B=1mA*
Base-Emitter Turn-On Voltage	$V_{BE(on)}$		1.7		1.7	V	I_C=1A, V_{CE}=5V*

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

PARAMETER	SYMBOL	ZTX604		ZTX605		UNIT	CONDITIONS.
		MIN.	MAX.	MIN.	MAX.		
Static Forward Current Transfer Ratio	h_{FE}	2K		2K			I_C=50mA, V_{CE}=5V
		5K		5K			I_C=500mA, V_{CE}=5V*
		2K	100K	2K	100K		I_C=1A, V_{CE}=5V*
		0.5K		0.5K			I_C=2A, V_{CE}=5V*
Transition Frequency	f_T	150		150		MHz	I_C=100mA, V_{CE}=10V f=20MHz
Input Capacitance	C_{ibo}	90 Typical				pF	V_{EB}=500mV, f=1MHz
Output Capacitance	C_{obo}	15 Typical				pF	V_{CB}=10V, f=1MHz
Switching Times	t_{on}	0.5 Typical				µs	I_C=500mA, V_{CE}=10V I_{B1}=I_{B2}=0.5mA
	t_{off}	1.6 Typical				µs	

*Measured under pulsed conditions. Pulse width=300µs. Duty cycle ≤2%



Voltage Derating Graph

The maximum permissible operational temperature can be obtained from this graph using the following equation

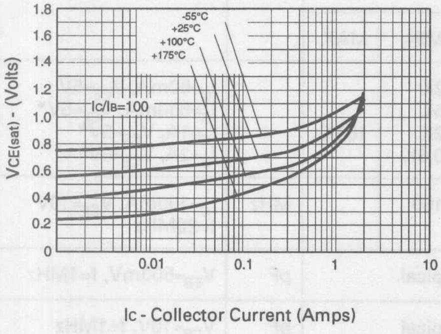
$$T_{amb(max)} = \frac{Power(max) - Power(act)}{0.0057} + 25^\circ C$$

$T_{amb(max)}$= Maximum operating ambient temperature

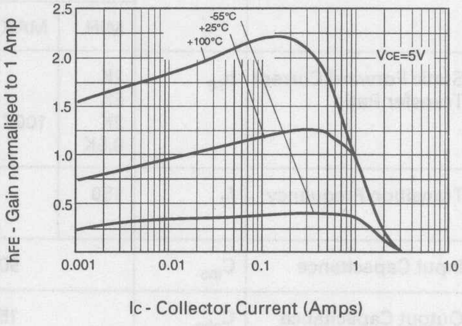
Power(max) = Maximum power dissipation figure, obtained from the above graph for a given V_{CE} and source resistance (R_S)

Power(actual)= Actual power dissipation in users circuit

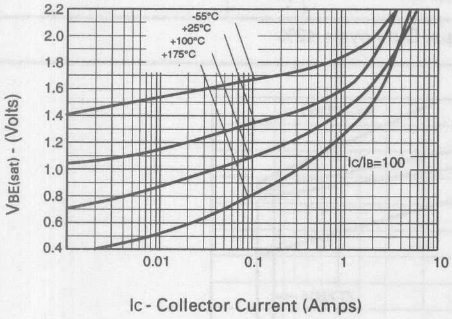
TYPICAL CHARACTERISTICS



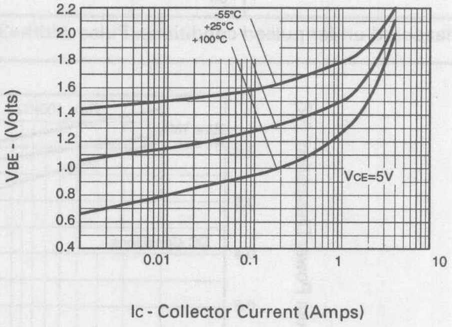
VCE(sat) v IC



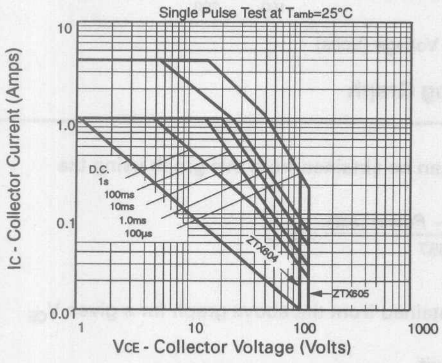
hFE v IC



VBE(sat) v IC



VBE(on) v IC



Safe Operating Area

NPN SILICON PLANAR MEDIUM POWER DARLINGTON TRANSISTOR

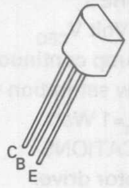
ZTX614

ISSUE 1 – APRIL 94

FEATURES

- 100 Volt V_{CEO}
- 800 mA continuous current
- Gain of 10K at I_C=500mA
- P_{tot}=1 Watt

REFER TO BCX38 FOR GRAPHS



E-line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	120	V
Collector-Emitter Voltage	V_{CEO}	100	V
Emitter-Base Voltage	V_{EBO}	10	V
Continuous Collector Current	I_C	800	mA
Power Dissipation at T_{amb}=25°C derate above 25°C	P_{tot}	1.0 5.7	W mW/°C
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +200	°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C).

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	120			V	I_C=10μA, I_E=0
Collector-Emitter Sustaining Voltage	$V_{CEO(sus)}$	100			V	I_C=10mA, I_B=0*
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	10			V	I_E=10μA, I_C=0
Collector Cut-Off Current	I_{CBO}			100	nA	V_{CB}=60V, I_E=0
Emitter Cut-Off Current	I_{EBO}			100	nA	V_{EB}=8V, I_C=0
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$			1.25	V	I_C=800mA, I_B=8mA*
Base-Emitter Turn-On Voltage	$V_{BE(on)}$			1.8	V	I_C=800mA, V_{CE}=5V*
Static Forward Current Transfer Ratio	h_{FE}	5000 10000				I_C=100mA, V_{CE}=5V* I_C=500mA, V_{CE}=5V*

*Measured under pulsed conditions. Pulse Width=300μs. Duty cycle ≤2%

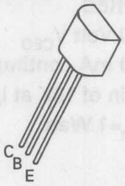
NPN SILICON PLANAR MEDIUM POWER TRANSISTOR

ZTX649

ISSUE 2 – APRIL 94

FEATURES
- 25 Volt V_{CEO}
- 2 Amp continuous current
- Low saturation voltage
- P_{tot}=1 Watt

APPLICATIONS
- Motor driver
- DC-DC converters



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	35	V
Collector-Emitter Voltage	V_{CEO}	25	V
Emitter-Base Voltage	V_{EBO}	5	V
Peak Pulse Current	I_{CM}	6	A
Continuous Collector Current	I_C	2	A
Power Dissipation at T_{amb}=25°C derate above 25°C	P_{tot}	1 5.7	W mW/ °C
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +200	°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	35			V	I_C=100µA
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	25			V	I_C=10mA*
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	5			V	I_E=100µA
Collector Cut-Off Current	I_{CBO}			0.1 10	µA µA	V_{CB}=30V V_{CB}=30V,T_{amb}=100°C
Emitter Cut-Off Current	I_{EBO}			0.1	µA	V_{EB}=4V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$		0.12 0.23	0.3 0.5	V V	I_C=1A, I_B=100mA* I_C=2A, I_B=200mA*
Base-Emitter Saturation Voltage	$V_{BE(sat)}$		0.9	1.25	V	I_C=1A, I_B=100mA*
Base-Emitter Turn-On Voltage	$V_{BE(on)}$		0.8	1	V	I_C=1A, V_{CE}=2V*
Static Forward Current Transfer Ratio	h_{FE}	70 100 75 15	200 200 150 50	 300 		I_C=50mA, V_{CE}=2V* I_C=1A, V_{CE}=2V* I_C=2A, V_{CE}=2V* I_C=6A, V_{CE}=2V*
Transition Frequency	f_T	150	240		MHz	I_C=100mA, V_{CE}=5V f=100MHz

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

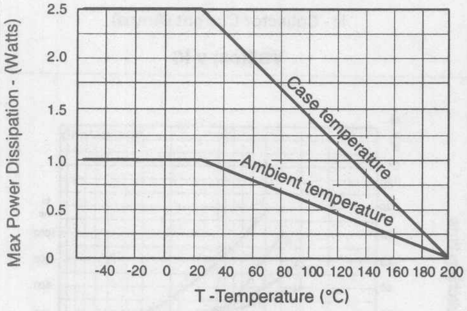
PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Output Capacitance	C_{obo}		25	50	pF	V_{CB}=10V f=1MHz
Switching Times	t_{on}		55		ns	I_C=500mA, V_{CC}=10V $I_{B1}=I_{B2}$=50mA
	t_{off}		300		ns	

*Measured under pulsed conditions. Pulse Width=300µs. Duty cycle ≤2%

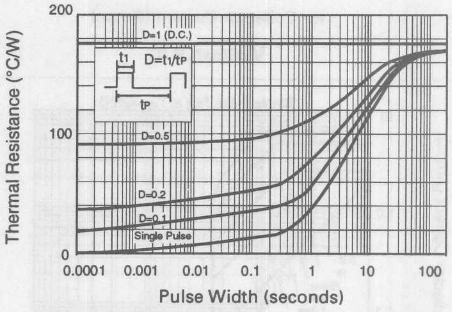
THERMAL CHARACTERISTICS

PARAMETER	SYMBOL	MAX.	UNIT
Thermal Resistance:Junction to Ambient$_1$	$R_{th(j-amb)1}$	175	°C/W
Junction to Ambient$_2$	$R_{th(j-amb)2}$ †	116	°C/W
Junction to Case	$R_{th(j-case)}$	70	°C/W

† Device mounted on P.C.B. with copper equal to 1 sq. Inch minimum.

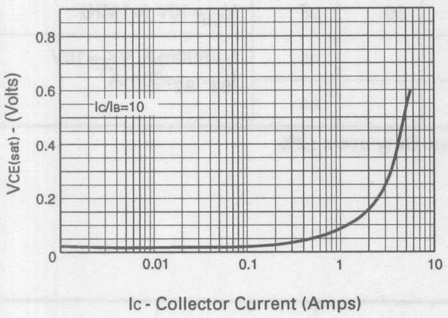


Derating curve

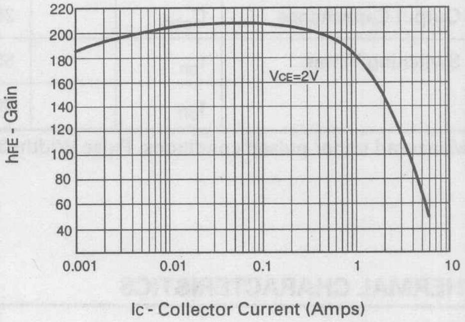


Maximum transient thermal impedance

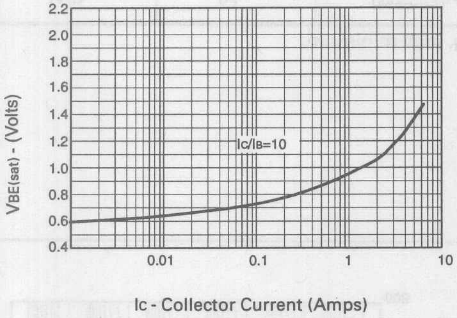
TYPICAL CHARACTERISTICS



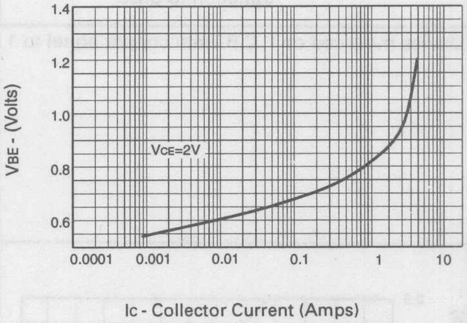
VCE(sat) v IC



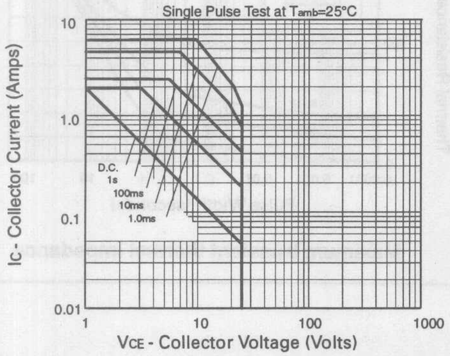
hFE v IC



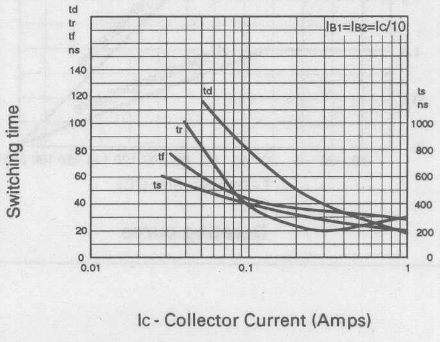
VBE(sat) v IC



VBE(on) v IC



Safe Operating Area



Switching Speeds

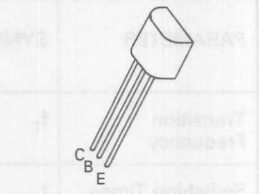
NPN SILICON PLANAR MEDIUM POWER TRANSISTORS

ZTX650
ZTX651

ISSUE 2 – JULY 94

FEATURES

- 60 Volt V_{CEO}
- 2 Amp continuous current
- Low saturation voltage
- P_{tot}=1 Watt



E-Line

TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	ZTX650	ZTX651	UNIT
Collector-Base Voltage	V_{CBO}	60	80	V
Collector-Emitter Voltage	V_{CEO}	45	60	V
Emitter-Base Voltage	V_{EBO}	5		V
Peak Pulse Current	I_{CM}	6		A
Continuous Collector Current	I_C	2		A
Power Dissipation at T_{amb}=25°C derate above 25°C	P_{tot}	1 5.7		W mW/°C
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +200		°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

PARAMETER	SYMBOL	ZTX650 MIN.	ZTX650 TYP.	ZTX650 MAX.	ZTX651 MIN.	ZTX651 TYP.	ZTX651 MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	60			80			V	I_C=100μA
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	45			60			V	I_C=10mA*
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	5			5			V	I_E=100μA
Collector Cut-Off Current	I_{CBO}			0.1				μA	V_{CB}=45V
							0.1	μA	V_{CB}=60V
				10				μA	V_{CB}=45V,T_{amb}=100°C
							10	μA	V_{CB}=60V,T_{amb}=100°C
Emitter Cut-Off Current	I_{EBO}			0.1			0.1	μA	V_{EB}=4V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$		0.12	0.3		0.12	0.3	V	I_C=1A, I_B=100mA*
			0.23	0.5		0.23	0.5	V	I_C=2A, I_B=200mA*
Base-Emitter Saturation Voltage	$V_{BE(sat)}$		0.9	1.25		0.9	1.25	V	I_C=1A, I_B=100mA*
Base-Emitter Turn-On Voltage	$V_{BE(on)}$		0.8	1		0.8	1	V	I_C=1A, V_{CE}=2V*
Static Forward Current Transfer Ratio	h_{FE}	70	200		70	200			I_C=50mA, V_{CE}=2V*
		100	200	300	100	200	300		I_C=500mA, V_{CE}=2V*
		80	170		80	170			I_C=1A, V_{CE}=2V*
		40	80		40	80			I_C=2A, V_{CE}=2V*

ZTX650
ZTX651

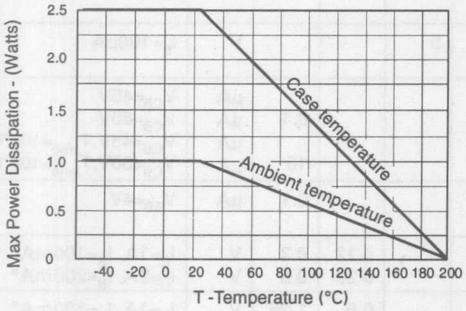
PARAMETER	SYMBOL	ZTX650			ZTX651			UNIT	CONDITIONS.
		MIN.	TYP.	MAX.	MIN.	TYP.	MAX.		
Transition Frequency	f_T	140	175		140	175		MHz	I_C=100mA, V_{CE}=5V f=100MHz
Switching Times	t_{on}		45			45		ns	I_C=500mA, V_{CC}=10V I_{B1}=I_{B2}=50mA
	t_{off}		800			800		ns	
Output Capacitance	C_{obo}			30			30	pF	V_{CB}=10V f=1MHz

*Measured under pulsed conditions. Pulse width=300µs. Duty cycle ≤ 2%

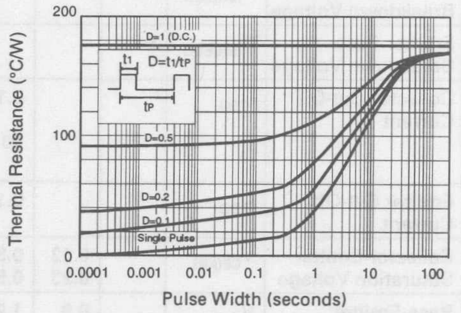
THERMAL CHARACTERISTICS

PARAMETER	SYMBOL	MAX.	UNIT
Thermal Resistance:Junction to Ambient$_1$	$R_{th(j\text{-}amb)1}$	175	°C/W
Junction to Ambient$_2$	$R_{th(j\text{-}amb)2}$†	116	°C/W
Junction to Case	$R_{th(j\text{-}case)}$	70	°C/W

† Device mounted on P.C.B. with copper equal to 1 sq. Inch minimum.



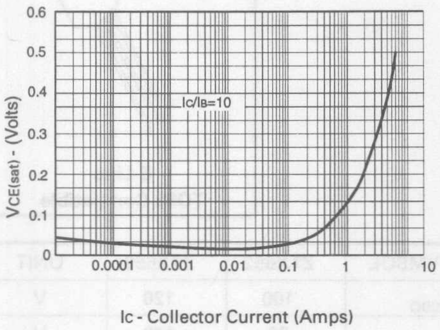
Derating curve



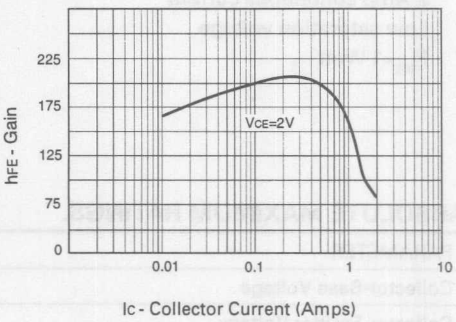
Maximum transient thermal impedance

ZTX650
ZTX651

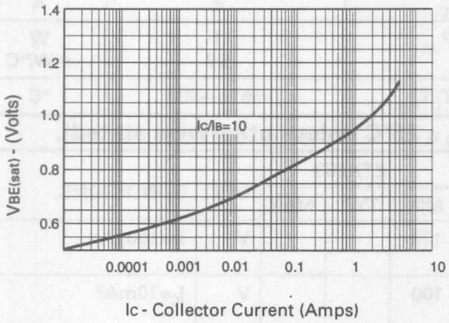
TYPICAL CHARACTERISTICS



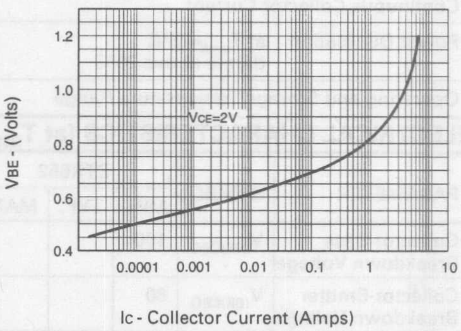
$V_{CE(sat)}$ v I_C



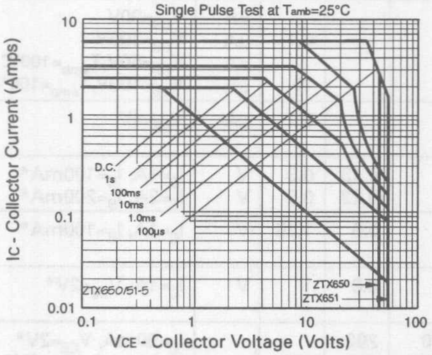
h_{FE} v I_C



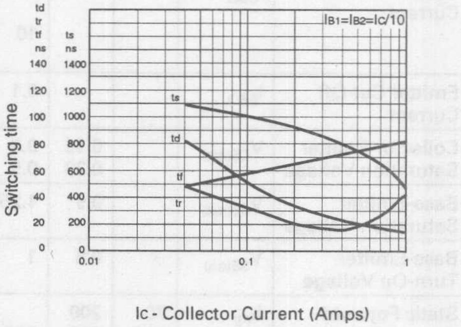
$V_{BE(sat)}$ v I_C



$V_{BE(on)}$ v I_C



Safe Operating Area



Switching Speeds

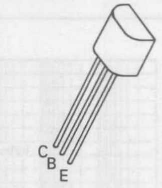
NPN SILICON PLANAR MEDIUM POWER TRANSISTORS

ZTX652 ZTX653

ISSUE 2 – JULY 94

FEATURES

- 100 Volt V_{CEO}
- 2 Amp continuous current
- Low saturation voltage
- P_{tot}=1 Watt



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	ZTX652	ZTX653	UNIT
Collector-Base Voltage	V_{CBO}	100	120	V
Collector-Emitter Voltage	V_{CEO}	80	100	V
Emitter-Base Voltage	V_{EBO}	5		V
Peak Pulse Current	I_{CM}	6		A
Continuous Collector Current	I_C	2		A
Power Dissipation at T_{amb}=25°C derate above 25°C	P_{tot}	1 5.7		W mW/°C
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +200		°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

PARAMETER	SYMBOL	ZTX652 MIN.	ZTX652 TYP.	ZTX652 MAX.	ZTX653 MIN.	ZTX653 TYP.	ZTX653 MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	100			120			V	I_C=100µA
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	80			100			V	I_C=10mA*
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	5			5			V	I_E=100µA
Collector Cut-Off Current	I_{CBO}			0.1				µA	V_{CB}=80V
							0.1	µA	V_{CB}=100V
				10				µA	V_{CB}=80V, T_{amb}=100°C
							10	µA	V_{CB}=100V, T_{amb}=100°C
Emitter Cut-Off Current	I_{EBO}			0.1			0.1	µA	V_{EB}=4V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$		0.13 0.23	0.3 0.5		0.13 0.23	0.3 0.5	V V	I_C=1A, I_B=100mA* I_C=2A, I_B=200mA*
Base-Emitter Saturation Voltage	$V_{BE(sat)}$		0.9	1.25		0.9	1.25	V	I_C=1A, I_B=100mA*
Base-Emitter Turn-On Voltage	$V_{BE(on)}$		0.8	1		0.8	1	V	I_C=1A, V_{CE}=2V*
Static Forward Current Transfer Ratio	h_{FE}	70 100 55 25	200 200 110 55	 300 	70 100 55 25	200 200 110 55	 300 		I_C=50mA, V_{CE}=2V* I_C=500mA, V_{CE}=2V* I_C=1A, V_{CE}=2V* I_C=2A, V_{CE}=2V*

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

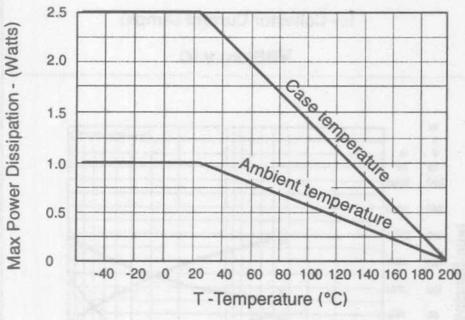
PARAMETER	SYMBOL	ZTX652			ZTX653			UNIT	CONDITIONS.
		MIN.	TYP.	MAX.	MIN.	TYP.	MAX.		
Transition Frequency	f_T	140	175		140	175		MHz	I_C=100mA, V_{CE}=5V f=100MHz
Switching Times	t_{on}		80			80		ns	I_C=500mA, V_{CC}=10V I_{B1}=I_{B2}=50mA
	t_{off}		1200			1200		ns	
Output Capacitance	C_{obo}			30			30	pF	V_{CB}=10V f=1MHz

*Measured under pulsed conditions. Pulse width=300µs. Duty cycle ≤ 2%

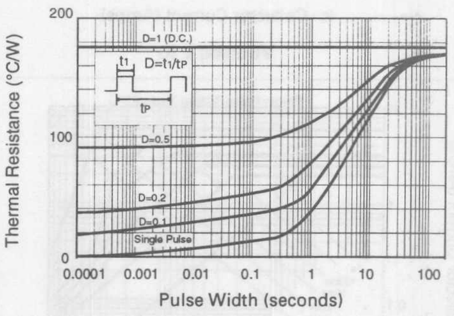
THERMAL CHARACTERISTICS

PARAMETER	SYMBOL	MAX.	UNIT
Thermal Resistance: Junction to Ambient$_1$	$R_{th(j-amb)1}$	175	°C/W
Junction to Ambient$_2$	$R_{th(j-amb)2}$†	116	°C/W
Junction to Case	$R_{th(j-case)}$	70	°C/W

† Device mounted on P.C.B. with copper equal to 1 sq. Inch minimum.



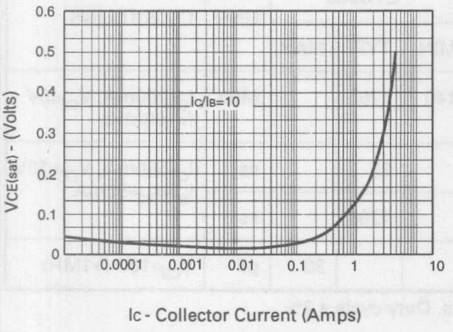
Derating curve



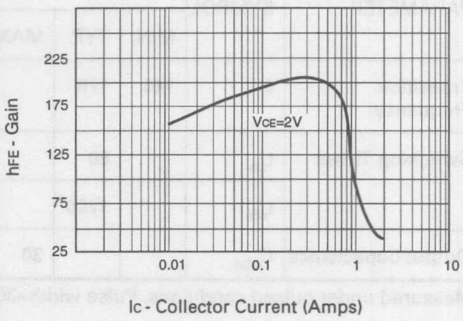
Maximum transient thermal impedance

ZTX652
ZTX653

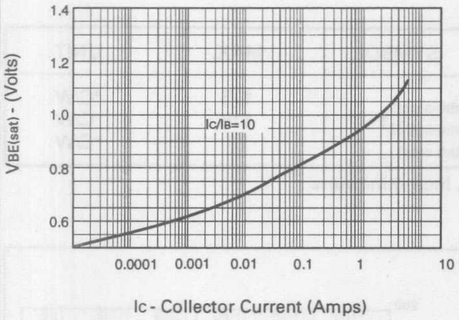
TYPICAL CHARACTERISTICS



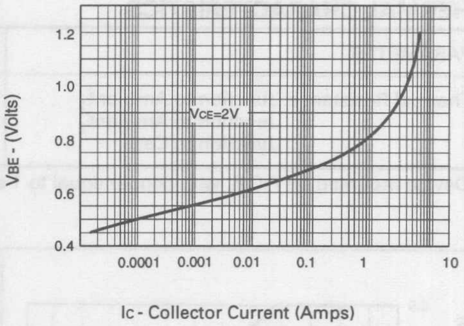
VCE(sat) v IC



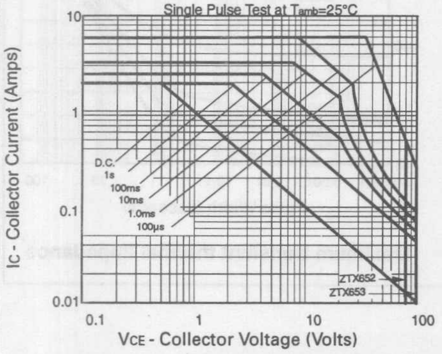
hFE v IC



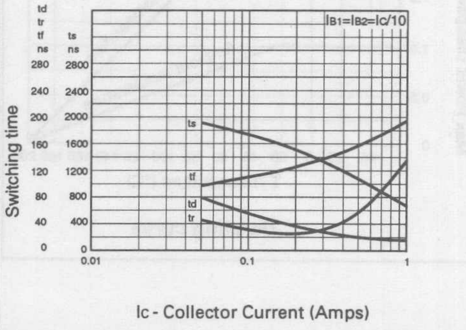
VBE(sat) v IC



VBE(on) v IC



Safe Operating Area



Switching Speeds

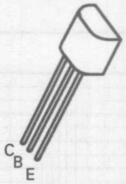
NPN SILICON PLANAR MEDIUM POWER TRANSISTORS

ISSUE 2 – JULY 94

ZTX654
ZTX655

FEATURES

- 150 Volt V_{CEO}
- 1 Amp continuous current
- Low saturation voltage
- P_{tot}= 1 Watt



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

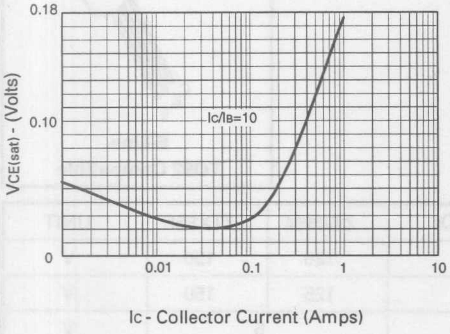
PARAMETER	SYMBOL	ZTX654	ZTX655	UNIT
Collector-Base Voltage	V_{CBO}	125	150	V
Collector-Emitter Voltage	V_{CEO}	125	150	V
Emitter-Base Voltage	V_{EBO}	5		V
Peak Pulse Current	I_{CM}	2		A
Continuous Collector Current	I_C	1		A
Power Dissipation at T_{amb}=25°C	P_{tot}	1		W
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +200		°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

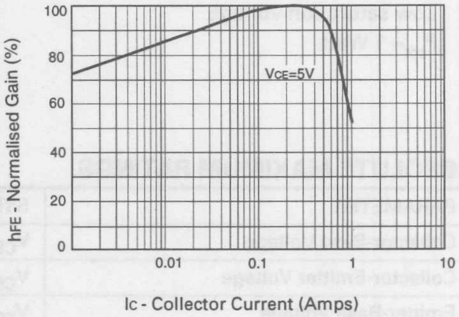
PARAMETER	SYMBOL	ZTX654		ZTX655		UNIT	CONDITIONS.
		MIN.	MAX.	MIN.	MAX.		
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	125		150		V	I_C=100μA, I_E=0
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	125		150		V	I_C=10mA, I_B=0*
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	5		5		V	I_E=100μA, I_C=0
Collector Cut-Off Current	I_{CBO}		100		100	nA nA	V_{CB}=100V, I_E=0 V_{CB}=125V, I_E=0
Emitter Cut-Off Current	I_{EBO}		100		100	nA	V_{EB}=3V, I_C=0
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$		0.5 0.5		0.5 0.5	V V	I_C=500mA, I_B=50mA* I_C=1A, I_B=200mA*
Base-Emitter Saturation Voltage	$V_{BE(sat)}$		1.1		1.1	V	I_C=500mA, I_B=50mA*
Base-Emitter Turn-On Voltage	$V_{BE(on)}$		1.0		1.0	V	I_C=500mA, V_{CE}=5V*
Static Forward Current Transfer Ratio	h_{FE}	50 50 20		50 50 20			I_C=10mA, V_{CE}=5V I_C=500mA, V_{CE}=5V* I_C=1A, V_{CE}=5V*
Transition Frequency	f_T	30		30		MHz	I_C=10mA, V_{CE}=20V f=20MHz
Output Capacitance	C_{obo}		20		20	pF	V_{CB}=20V, f=1MHz

*Measured under pulsed conditions. Pulse width=300μs. Duty cycle ≤2%

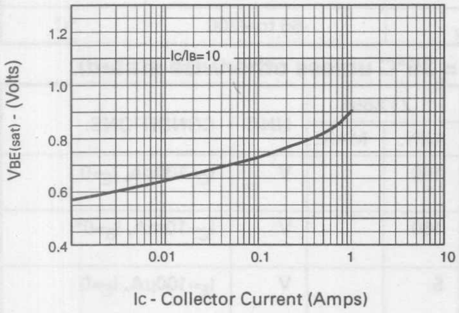
TYPICAL CHARACTERISTICS



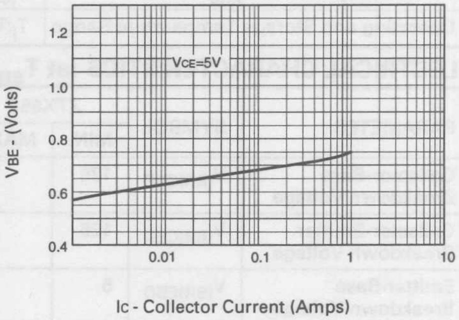
VCE(sat) v IC



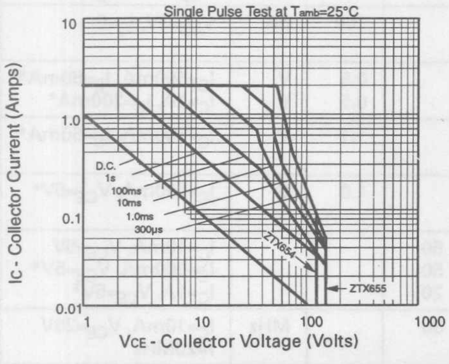
hFE v IC



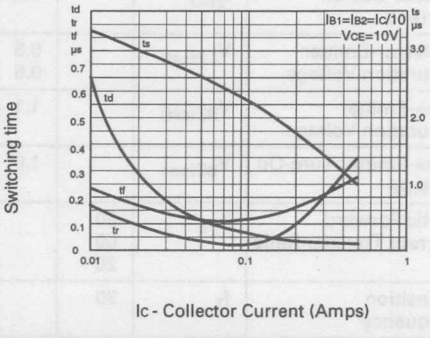
VBE(sat) v IC



VBE(on) v IC



Safe Operating Area



Switching Speeds

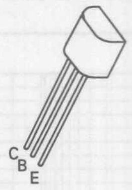
NPN SILICON PLANAR MEDIUM POWER HIGH VOLTAGE TRANSISTORS

ISSUE 2 – JULY 94

ZTX656
ZTX657

FEATURES

- 300 Volt V_{CEO}
- 0.5 Amp continuous current
- P_{tot}=1 Watt



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	ZTX656	ZTX657	UNIT
Collector-Base Voltage	V_{CBO}	200	300	V
Collector-Emitter Voltage	V_{CEO}	200	300	V
Emitter-Base Voltage	V_{EBO}	5		V
Peak Pulse Current	I_{CM}	1		A
Continuous Collector Current	I_C	0.5		A
Power Dissipation at T_{amb}=25°C	P_{tot}	1		W
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +200		°C

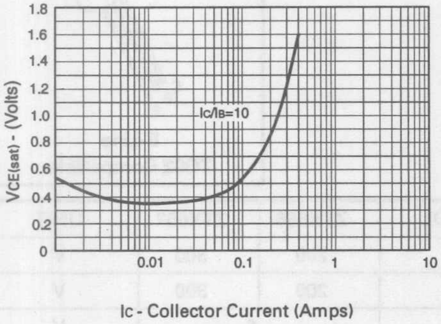
ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

PARAMETER	SYMBOL	ZTX656		ZTX657		UNIT	CONDITIONS.
		MIN.	MAX.	MIN.	MAX.		
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	200		300		V	I_C=100μA, I_E=0
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	200		300		V	I_C=10mA, I_B=0*
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	5		5		V	I_E=100μA, I_C=0
Collector Cut-Off Current	I_{CBO}		100		 100	nA nA	V_{CB}=160V, I_E=0 V_{CB}=200V, I_E=0
Emitter Cut-Off Current	I_{EBO}		100		100	nA	V_{EB}=3V, I_C=0
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$		0.5		0.5	V	I_C=100mA, I_B=10mA*
Base-Emitter Saturation Voltage	$V_{BE(sat)}$		1		1	V	I_C=100mA, I_B=10mA*
Base-Emitter Turn-On Voltage	$V_{BE(on)}$		1		1	V	I_C=100mA, V_{CE}=5V*
Static Forward Current Transfer Ratio	h_{FE}	50 40		50 40			I_C=100mA, V_{CE}=5V I_C=10mA, V_{CE}=5V
Transition Frequency	f_T	30		30		MHz	I_C=10mA, V_{CE}=20V f=20MHz
Output Capacitance	C_{obo}		20		20	pF	V_{CB}=20V, f=1MHz

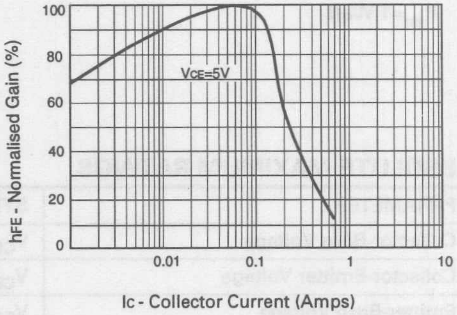
*Measured under pulsed conditions. Pulse width=300μs. Duty cycle ≤2%

ZTX656
ZTX657

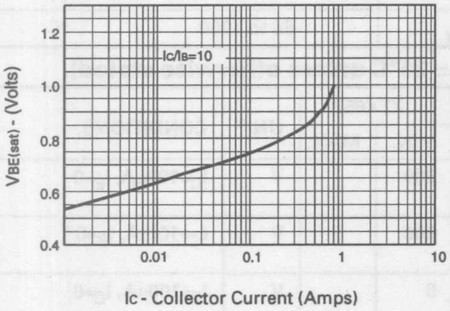
TYPICAL CHARACTERISTICS



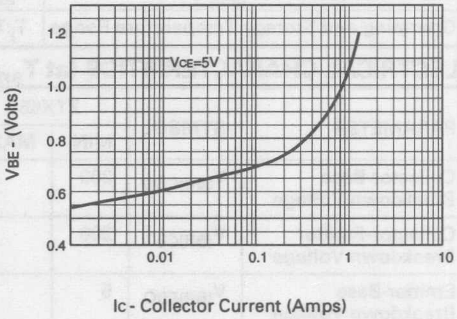
VCE(sat) v IC



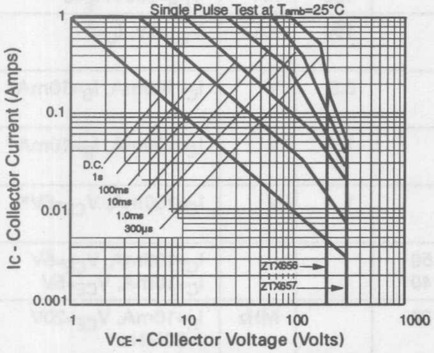
hFE v IC



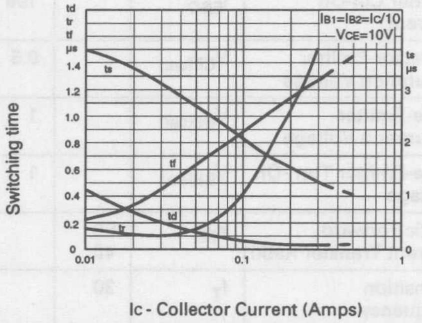
VBE(sat) v IC



VBE(on) v IC



Safe Operating Area



Switching Speeds

NPN SILICON PLANAR MEDIUM POWER HIGH VOLTAGE TRANSISTOR

ZTX658

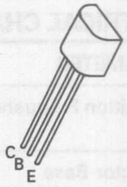
ISSUE 1 – APRIL 94

FEATURES

- 400 Volt V_{CEO}
- 0.5 Amp continuous current
- P_{tot}=1 Watt

APPLICATIONS

- Telephone dialler circuits



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	400	V
Collector-Emitter Voltage	V_{CEO}	400	V
Emitter-Base Voltage	V_{EBO}	5	V
Peak Pulse Current	I_{CM}	1	A
Continuous Collector Current	I_C	500	mA
Power Dissipation at T_{amb}=25°C derate above 25°C	P_{tot}	1 5.7	W mW/ °C
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +200	°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	400			V	I_C=100μA
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO)}$	400			V	I_C=10mA*
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	5			V	I_E=100μA
Collector Cut-Off Current	I_{CBO}			100	nA	V_{CB}=320V
Collector Cut-Off Current	I_{CBO}			100	nA	V_{CE}=320V
Emitter Cut-Off Current	I_{EBO}			100	nA	V_{EB}=4V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$			0.3 0.25 0.5	V V V	I_C=20mA, I_B=1mA I_C=50mA, I_B=5mA* I_C=100mA, I_B=10mA*
Base-Emitter Saturation Voltage	$V_{BE(sat)}$			0.9	V	I_C=100mA, I_B=10mA*
Base-Emitter Turn On Voltage	$V_{BE(on)}$			0.9	V	I_C=100mA, V_{CE}=5V*
Static Forward Current Transfer Ratio	h_{FE}	50 50 40				I_C=1mA, V_{CE}=5V* I_C=100mA, V_{CE}=5V* I_C=200mA, V_{CE}=10V*

ZTX658

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

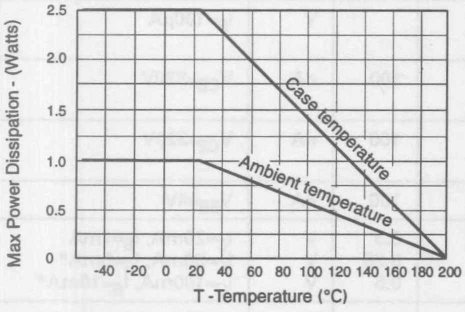
PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Transition Frequency	f_T	50			MHz	I_C=20mA, V_{CE}=20V f=20MHz
Collector-Base Breakdown Voltage	C_{obo}			10	pF	V_{CB}=20V, f=1MHz
Switching times	t_{on} t_{off}		130 3300		ns ns	I_C=100mA, V_C=100V I_{B1}=10mA, I_{B2}=-20mA

* Measured under pulsed conditions. Pulse width=300µs. Duty cycle ≤2%

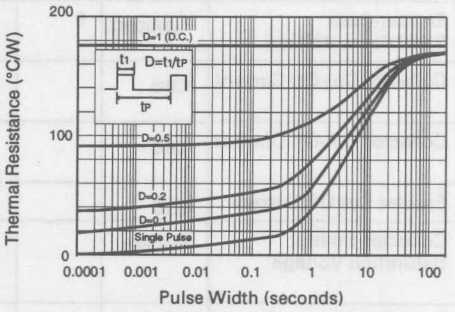
THERMAL CHARACTERISTICS

PARAMETER	SYMBOL	MAX.	UNIT
Thermal Resistance:Junction to Ambient$_1$	$R_{th(j-amb)1}$	175	°C/W
Junction to Ambient$_2$	$R_{th(j-amb)2}$	116	°C/W
Junction to Case	$R_{th(j-case)}$	70	°C/W

† Device mounted on P.C.B. with copper equal to 1 sq. inch minimum.



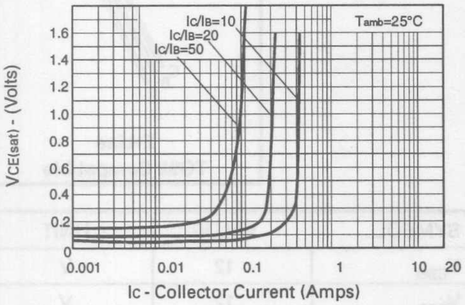
Derating curve



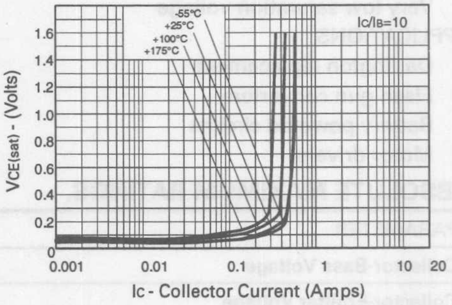
Maximum transient thermal impedance

ZTX658

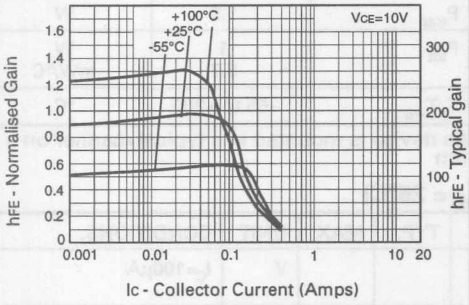
TYPICAL CHARACTERISTICS



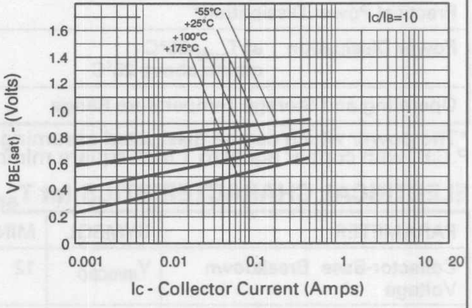
$V_{CE(sat)}$ v I_C



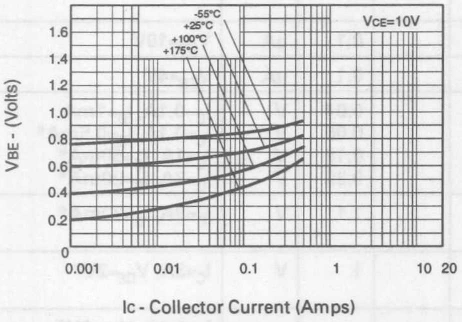
$V_{CE(sat)}$ v I_C



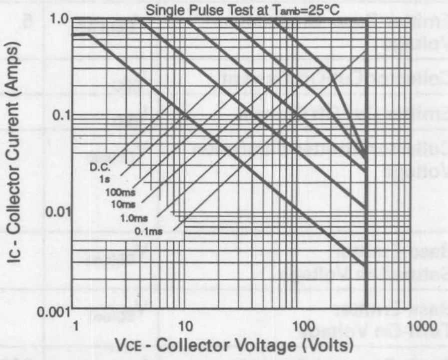
h_{FE} v I_C



$V_{BE(sat)}$ v I_C



$V_{BE(on)}$ v I_C



Safe Operating Area

NPN SILICON PLANAR MEDIUM POWER HIGH GAIN TRANSISTOR

ZTX688B

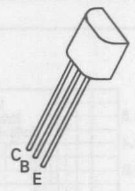
ISSUE 2 – MAY 94

FEATURES

- 12 Volt V_{CEO}
- Gain of 400 at I_C=3 Amps
- Very low saturation voltage

APPLICATIONS

- Darlington replacement
- Flash gun convertors
- Battery powered circuits
- Motor drivers



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	12	V
Collector-Emitter Voltage	V_{CEO}	12	V
Emitter-Base Voltage	V_{EBO}	5	V
Peak Pulse Current	I_{CM}	10	A
Continuous Collector Current	I_C	3	A
Practical Power Dissipation*	P_{totp}	1.5	W
Power Dissipation at T_{amb}=25°C derate above 25°C	P_{tot}	1 5.7	W mW/°C
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +200	°C

*The power which can be dissipated assuming the device is mounted in a typical manner on a P.C.B. with copper equal to 1 inch square minimum

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C)

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	12			V	I_C=100μA
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	12			V	I_C=10mA*
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	5			V	I_E=100μA
Collector Cut-Off Current	I_{CBO}			0.1	μA	V_{CB}=10V
Emitter Cut-Off Current	I_{EBO}			0.1	μA	V_{EB}=4V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$			0.04 0.06 0.18 0.35	V V V V	I_C=0.1A, I_B=1mA I_C=0.1A, I_B=0.5mA* I_C=1A, I_B=50mA* I_C=3A, I_B=20mA*
Base-Emitter Saturation Voltage	$V_{BE(sat)}$			1.1	V	I_C=3A, I_B=20mA*
Base-Emitter Turn-On Voltage	$V_{BE(on)}$			1	V	I_C=3A, V_{CE}=2V*
Static Forward Current Transfer Ratio	h_{FE}	500 400 100				I_C=0.1A, V_{CE}=2V* I_C=3A, V_{CE}=2V* I_C=10A, V_{CE}=2V*

ELECTRICAL CHARACTERISTICS (at $T_{amb} = 25°C$)

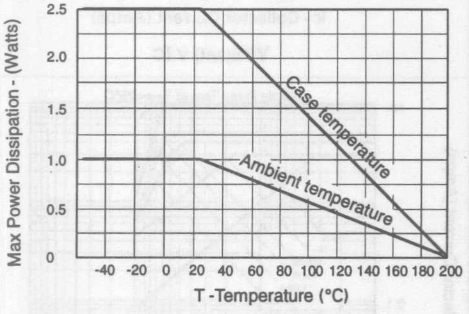
PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Transition Frequency	f_T	150			MHz	I_C=50mA, V_{CE}=5V f=50MHz
Input Capacitance	C_{ibo}		200		pF	V_{EB}=0.5V, f=1MHz
Output Capacitance	C_{obo}		40		pF	V_{CB}=10V, f=1MHz
Switching Times	t_{on} t_{off}		40 500		ns ns	I_C=500mA, I_{B1}=50mA I_{B2}=50mA, V_{CC}=10V

*Measured under pulsed conditions. Pulse width=300µs. Duty cycle ≤2%

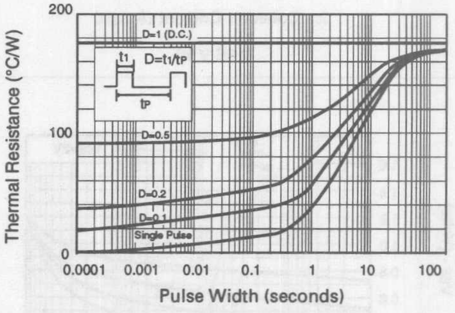
THERMAL CHARACTERISTICS

PARAMETER	SYMBOL	MAX.	UNIT
Thermal Resistance:Junction to Ambient$_1$	$R_{th(j-amb)1}$	175	°C/W
Junction to Ambient$_2$	$R_{th(j-amb)2}$†	116	°C/W
Junction to Case	$R_{th(j-case)}$	70	°C/W

† Device mounted on P.C.B. with copper equal to 1 sq. Inch minimum.



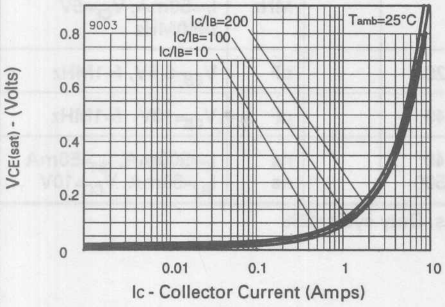
Derating curve



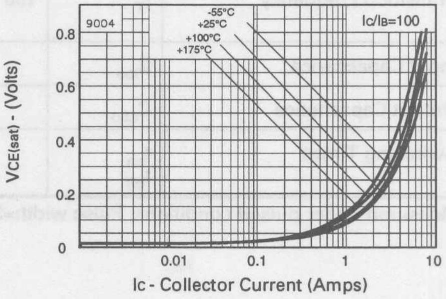
Maximum transient thermal impedance

ZTX688B

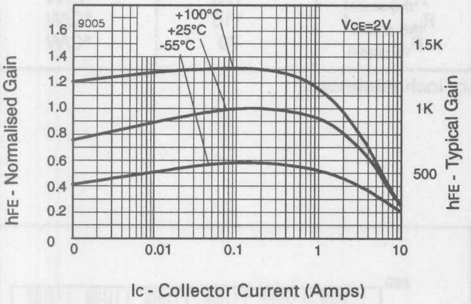
TYPICAL CHARACTERISTICS



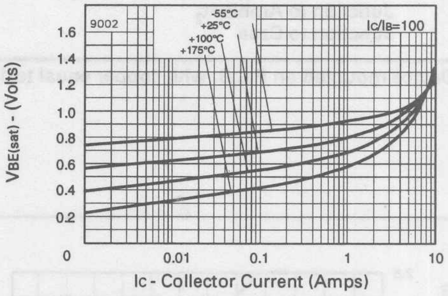
VCE(sat) v IC



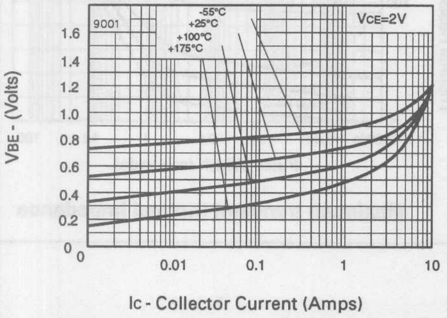
VCE(sat) v IC



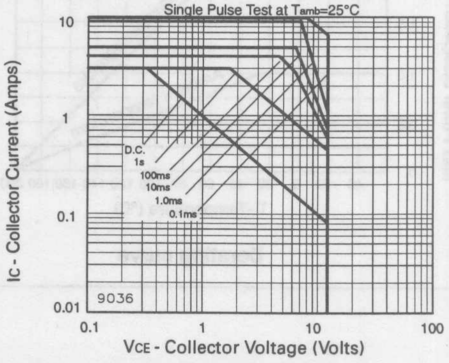
hFE v IC



VBE(sat) v IC



VBE(on) v IC



Safe Operating Area

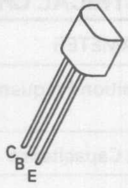
NPN SILICON PLANAR MEDIUM POWER HIGH GAIN TRANSISTOR

ZTX689B

ISSUE 1 – MAY 94

FEATURES
- 20 Volt V_{CEO}
- Gain of 400 at I_C=2 Amps
- Very low saturation voltage

APPLICATIONS
- Darlington replacement
- Flash gun convertors
- Battery powered circuits
- Motor drivers



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	20	V
Collector-Emitter Voltage	V_{CEO}	20	V
Emitter-Base Voltage	V_{EBO}	5	V
Peak Pulse Current	I_{CM}	8	A
Continuous Collector Current	I_C	3	A
Practical Power Dissipation*	P_{totp}	1.5	W
Power Dissipation at T_{amb}=25°C derate above 25°C	P_{tot}	1 5.7	W mW/°C
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +200	°C

*The power which can be dissipated assuming the device is mounted in a typical manner on a P.C.B. with copper equal to 1 inch square minimum

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C)

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	20			V	I_C=100μA
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	20			V	I_C=10mA*
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	5			V	I_E=100μA
Collector Cut-Off Current	I_{CBO}			0.1	μA	V_{CB}=16V
Emitter Cut-Off Current	I_{EBO}			0.1	μA	V_{EB}=4V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$			0.1 0.5	V V	I_C=0.1A, I_B=0.5mA* I_C=2A, I_B=10mA*
Base-Emitter Saturation Voltage	$V_{BE(sat)}$			0.9	V	I_C=1A, I_B=10mA*
Base-Emitter Turn-On Voltage	$V_{BE(on)}$			0.9	V	I_C=1A, V_{CE}=2V*
Static Forward Current Transfer Ratio	h_{FE}	500 400 150				I_C=0.1A, V_{CE}=2V* I_C=2A, V_{CE}=2V* I_C=6A, V_{CE}=2V*

ZTX689B

ELECTRICAL CHARACTERISTICS (at $T_{amb} = 25°C$)

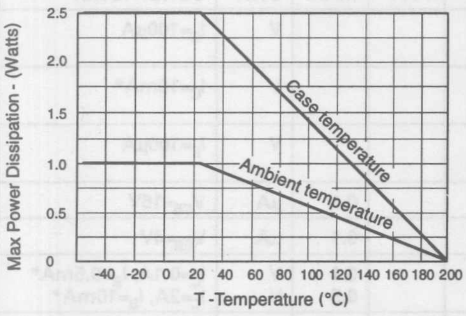
PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Transition Frequency	f_T	150			MHz	I_C=50mA, V_{CE}=5V f=50MHz
Input Capacitance	C_{ibo}		200		pF	V_{EB}=0.5V, f=1MHz
Output Capacitance	C_{obo}		16		pF	V_{CB}=10V, f=1MHz
Switching Times	t_{on} t_{off}		30 800		ns ns	I_C=500mA, I_{B1}=50mA I_{B2}=50mA, V_{CC}=10V

*Measured under pulsed conditions. Pulse width=300µs. Duty cycle ≤2%

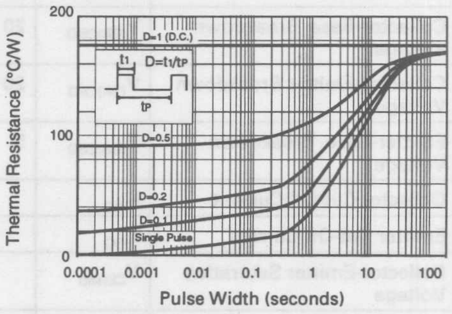
THERMAL CHARACTERISTICS

PARAMETER	SYMBOL	MAX.	UNIT
Thermal Resistance:Junction to Ambient$_1$	$R_{th(j-amb)1}$	175	°C/W
Junction to Ambient$_2$	$R_{th(j-amb)2}$†	116	°C/W
Junction to Case	$R_{th(j-case)}$	70	°C/W

† Device mounted on P.C.B. with copper equal to 1 sq. Inch minimum.

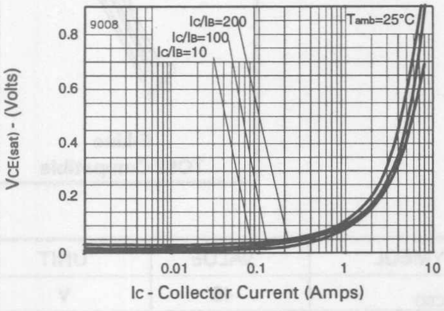


Derating curve

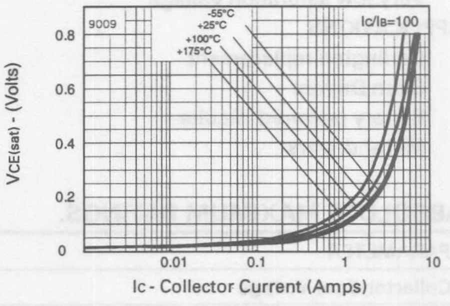


Maximum transient thermal impedance

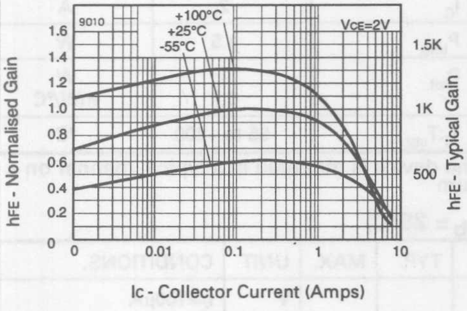
TYPICAL CHARACTERISTICS



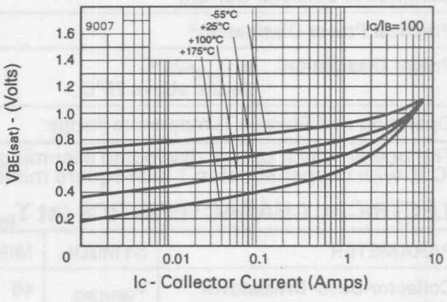
VCE(sat) v IC



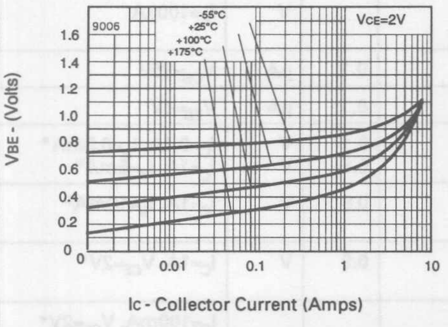
VCE(sat) v IC



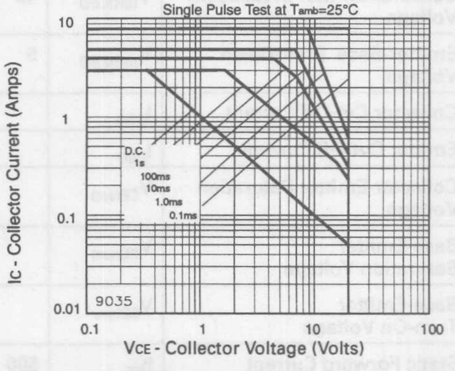
hFE v IC



VBE(sat) v IC



VBE(on) v IC



Safe Operating Area

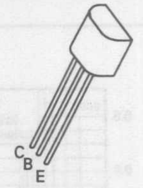
NPN SILICON PLANAR MEDIUM POWER HIGH GAIN TRANSISTOR

ZTX690B

ISSUE 1 – MAY 94

FEATURES
- 45 Volt V_{CEO}
- Gain of 400 at I_C=1 Amp
- Very low saturation voltage

APPLICATIONS
- Darlington replacement
- Siren Drivers
- Battery powered circuits
- Motor drivers



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	45	V
Collector-Emitter Voltage	V_{CEO}	45	V
Emitter-Base Voltage	V_{EBO}	5	V
Peak Pulse Current	I_{CM}	6	A
Continuous Collector Current	I_C	2	A
Practical Power Dissipation*	P_{totp}	1.5	W
Power Dissipation at T_{amb}=25°C derate above 25°C	P_{tot}	1 5.7	W mW/°C
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +200	°C

*The power which can be dissipated assuming the device is mounted in a typical manner on a P.C.B. with copper equal to 1 inch square minimum

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C)

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	45			V	I_C=100μA
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	45			V	I_C=10mA*
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	5			V	I_E=100μA
Collector Cut-Off Current	I_{CBO}			0.1	μA	V_{CB}=35V
Emitter Cut-Off Current	I_{EBO}			0.1	μA	V_{EB}=4V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$			0.1 0.5	V V	I_C=0.1A, I_B=0.5mA* I_C=1A, I_B=5mA*
Base-Emitter Saturation Voltage	$V_{BE(sat)}$			0.9	V	I_C=1A, I_B=10mA*
Base-Emitter Turn-On Voltage	$V_{BE(on)}$			0.9	V	I_C=1A, V_{CE}=2V*
Static Forward Current Transfer Ratio	h_{FE}	500 400 150				I_C=100mA, V_{CE}=2V* I_C=1A, V_{CE}=2V* I_C=2A, V_{CE}=2V*

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C)

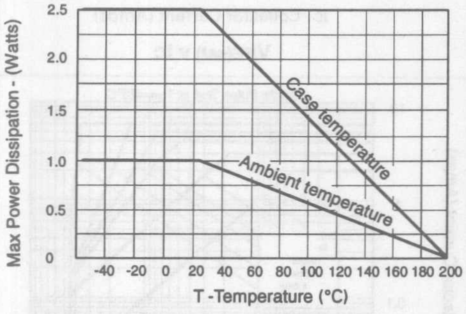
PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Transition Frequency	f_T	150			MHz	I_C=50mA, V_{CE}=5V f=50MHz
Input Capacitance	C_{ibo}		200		pF	V_{EB}=0.5V, f=1MHz
Output Capacitance	C_{obo}		16		pF	V_{CB}=10V, f=1MHz
Switching Times	t_{on} t_{off}		33 1300		ns ns	I_C=500mA, I_{BI}=50mA I_{B2}=50mA, V_{CC}=10V

*Measured under pulsed conditions. Pulse width=300µs. Duty cycle ≤2%

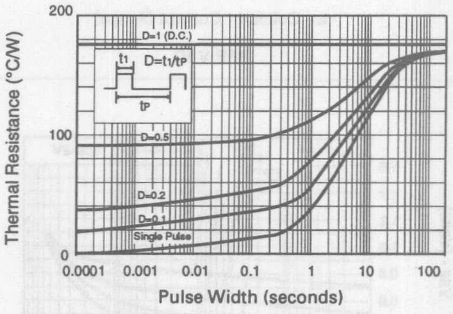
THERMAL CHARACTERISTICS

PARAMETER	SYMBOL	MAX.	UNIT
Thermal Resistance:Junction to Ambient$_1$	$R_{th(j\text{-}amb)1}$	175	°C/W
Junction to Ambient$_2$	$R_{th(j\text{-}amb)2}$†	116	°C/W
Junction to Case	$R_{th(j\text{-}case)}$	70	°C/W

† Device mounted on P.C.B. with copper equal to 1 sq. Inch minimum.

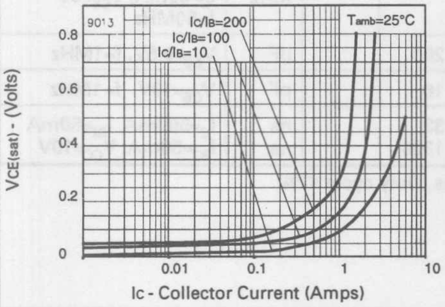


Derating curve

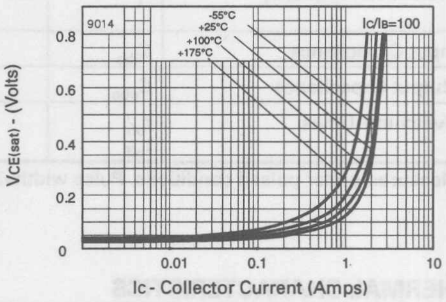


Maximum transient thermal impedance

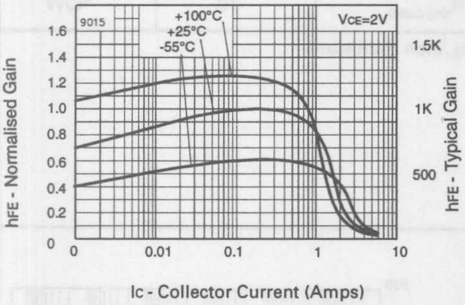
TYPICAL CHARACTERISTICS



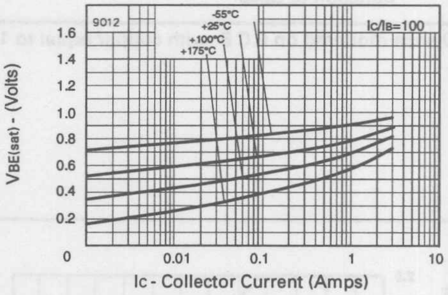
VCE(sat) v IC



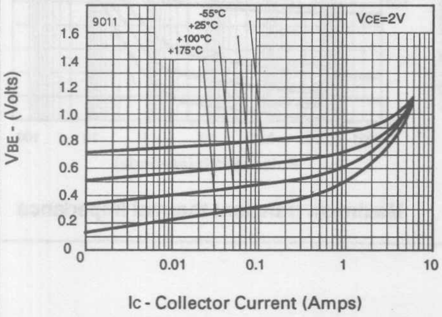
VCE(sat) v IC



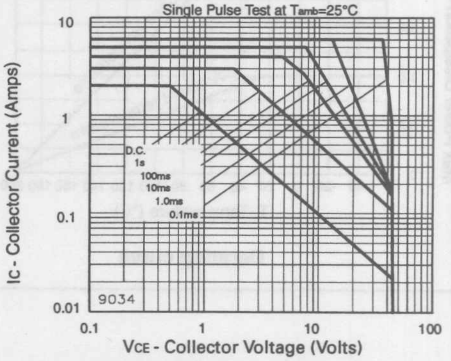
hFE v IC



VBE(sat) v IC



VBE(on) v IC



Safe Operating Area

NPN SILICON PLANAR MEDIUM POWER HIGH GAIN TRANSISTOR

ZTX692B

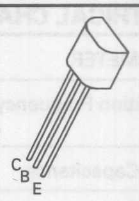
ISSUE 1 – APRIL 94

FEATURES

- 70 Volt V_{CEO}
- Gain of 400 at I_C=500mA
- Very low saturation voltage

APPLICATIONS

- Darlington replacement
- Relay drivers
- Battery powered circuits
- Motor drivers



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER		SYMBOL	VALUE	UNIT
Collector-Base Voltage		V_{CBO}	70	V
Collector-Emitter Voltage		V_{CEO}	70	V
Emitter-Base Voltage		V_{EBO}	5	V
Peak Pulse Current		I_{CM}	2	A
Continuous Collector Current		I_C	1	A
Practical Power Dissipation*		P_{totp}	1.5	W
Power Dissipation	at T_{amb}=25°C derate above 25°C	P_{tot}	1 5.7	W mW/°C
Operating and Storage Temperature Range		T_j:T_{stg}	-55 to +200	°C

*The power which can be dissipated assuming the device is mounted in a typical manner on a P.C.B. with copper equal to 1 inch square minimum

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C)

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	70			V	I_C=100µA
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	70			V	I_C=10mA*
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	5			V	I_E=100µA
Collector Cut-Off Current	I_{CBO}			0.1	µA	V_{CB}=55V
Emitter Cut-Off Current	I_{EBO}			0.1	µA	V_{EB}=4V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$			0.15 0.5	V V	I_C=0.1A, I_B=0.5mA* I_C=1A, I_B=10mA*
Base-Emitter Saturation Voltage	$V_{BE(sat)}$			0.9	V	I_C=1A, I_B=10mA*
Base-Emitter Turn-On Voltage	$V_{BE(on)}$			0.9	V	I_C=1A, V_{CE}=2V*
Static Forward Current Transfer Ratio	h_{FE}	500 400 150				I_C=100mA, V_{CE}=2V* I_C=500mA, V_{CE}=2V* I_C=1A, V_{CE}=2V*

ZTX692B

ELECTRICAL CHARACTERISTICS (at $T_{amb} = 25°C$)

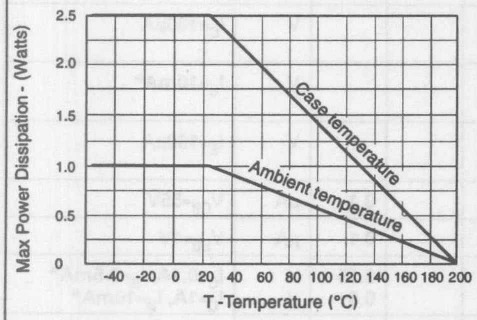
PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Transition Frequency	f_T	150			MHz	I_C=50mA, V_{CE}=5V f=50MHz
Input Capacitance	C_{ibo}		200		pF	V_{EB}=0.5V, f=1MHz
Output Capacitance	C_{obo}		12		pF	V_{CB}=10V, f=1MHz
Switching Times	t_{on} t_{off}		46 1440		ns ns	I_C=500mA, I_{BI}=50mA I_{BZ}=50mA, V_{CC}=10V

*Measured under pulsed conditions. Pulse width=300µs. Duty cycle ≤2%

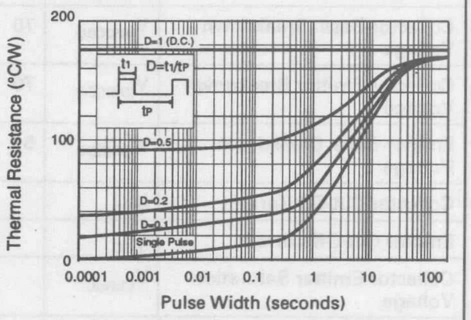
THERMAL CHARACTERISTICS

PARAMETER	SYMBOL	MAX.	UNIT
Thermal Resistance: Junction to Ambient$_1$	$R_{th(j\text{-}amb)1}$	175	°C/W
Junction to Ambient$_2$	$R_{th(j\text{-}amb)2}$†	116	°C/W
Junction to Case	$R_{th(j\text{-}case)}$	70	°C/W

† Device mounted on P.C.B. with copper equal to 1 sq. Inch minimum.



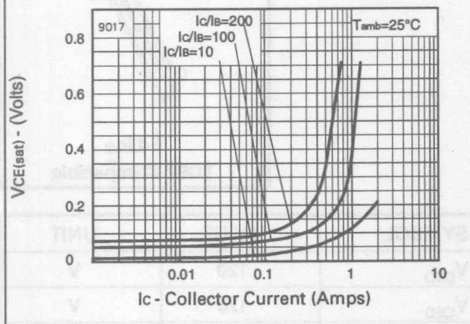
Derating curve



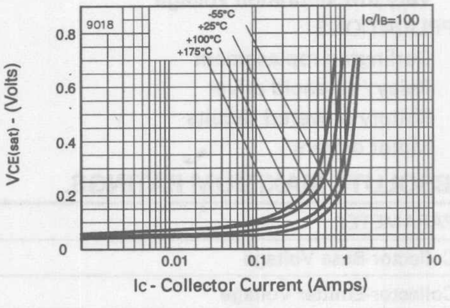
Maximum transient thermal impedance

ZTX692B

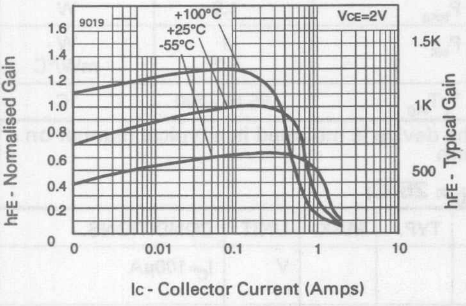
TYPICAL CHARACTERISTICS



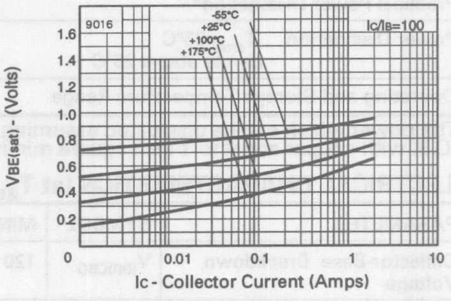
VCE(sat) v IC



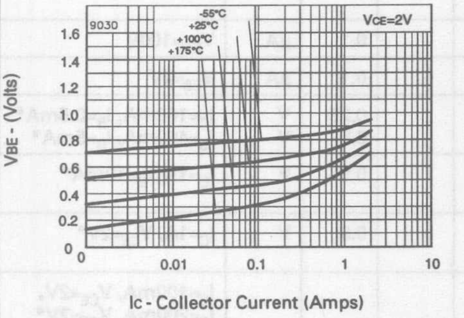
VCE(sat) v IC



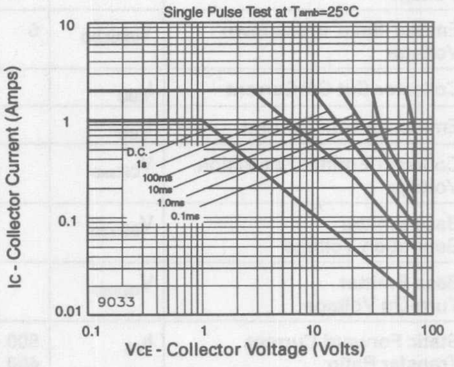
hFE v IC



VBE(sat) v IC



VBE(on) v IC



Safe Operating Area

NPN SILICON PLANAR MEDIUM POWER HIGH GAIN TRANSISTOR

ZTX694B

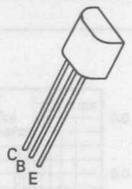
ISSUE 1 – APRII 94

FEATURES

- 120 Volt V_{CEO}
- Gain of 400 at I_C=200mA
- Very low saturation voltage

APPLICATIONS

- Darlington replacement
- Relay / solenoid driver
- Battery powered circuits
- Motor drivers



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	120	V
Collector-Emitter Voltage	V_{CEO}	120	V
Emitter-Base Voltage	V_{EBO}	5	V
Peak Pulse Current	I_{CM}	1	A
Continuous Collector Current	I_C	0.5	A
Practical Power Dissipation*	P_{totp}	1.5	W
Power Dissipation T_{amb}=25°C derate above 25°C	P_{tot}	1 5.7	W mW/°C
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +200	°C

*The power which can be dissipated assuming the device is mounted in a typical manner on a P.C.B. with copper equal to 1 inch square minimum

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C)

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	120			V	I_C=100µA
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	120			V	I_C=10mA*
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	5			V	I_E=100µA
Collector Cut-Off Current	I_{CBO}			0.1	µA	V_{CB}=100V
Emitter Cut-Off Current	I_{EBO}			0.1	µA	V_{EB}=4V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$			0.25 0.5	V V	I_C=100mA, I_B=0.5mA* I_C=400mA, I_B=5mA*
Base-Emitter Saturation Voltage	$V_{BE(sat)}$			0.9	V	I_C=1A, I_B=10mA*
Base-Emitter Turn-On Voltage	$V_{BE(on)}$			0.9	V	I_C=1A, V_{CE}=2V*
Static Forward Current Transfer Ratio	h_{FE}	500 400 150				I_C=100mA, V_{CE}=2V* I_C=200mA, V_{CE}=2V* I_C=400mA, V_{CE}=2V*

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C)

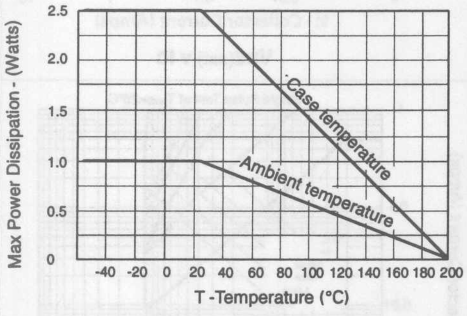
PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Transition Frequency	f_T	130			MHz	I_C=50mA, V_{CE}=5V f=50MHz
Input Capacitance	C_{ibo}		200		pF	V_{EB}=0.5V, f=1MHz
Output Capacitance	C_{obo}		9		pF	V_{CB}=10V, f=1MHz
Switching Times	t_{on} t_{off}		80 2900		ns ns	I_C=100mA, I_{B1}=10mA I_{B2}=10mA, V_{CC}=50V

*Measured under pulsed conditions. Pulse width=300µs. Duty cycle ≤2%

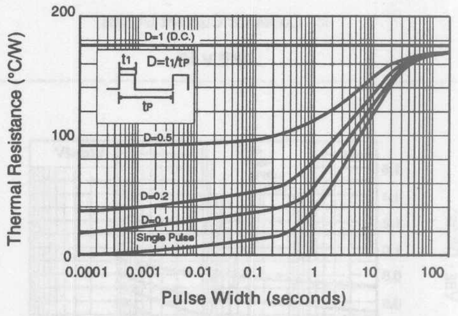
THERMAL CHARACTERISTICS

PARAMETER	SYMBOL	MAX.	UNIT
Thermal Resistance:Junction to Ambient$_1$ Junction to Ambient$_2$ Junction to Case	$R_{th(j-amb)1}$ $R_{th(j-amb)2}$† $R_{th(j-case)}$	175 116 70	°C/W °C/W °C/W

† Device mounted on P.C.B. with copper equal to 1 sq. Inch minimum.



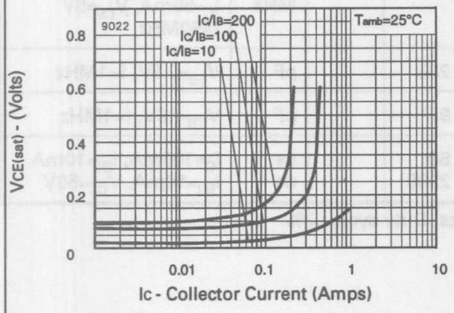
Derating curve



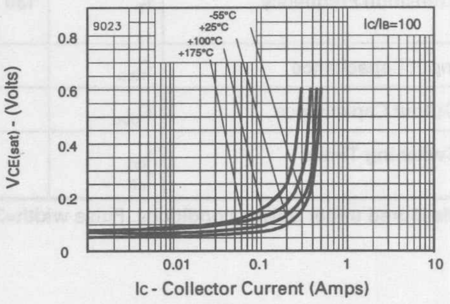
Maximum transient thermal impedance

ZTX694B

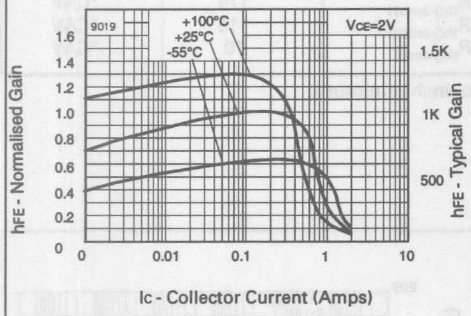
TYPICAL CHARACTERISTICS



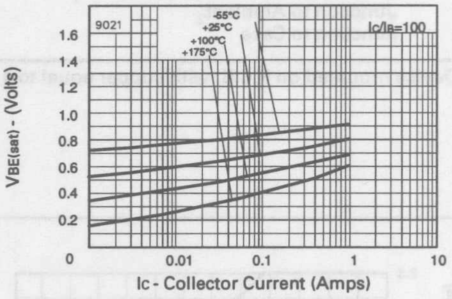
VCE(sat) v IC



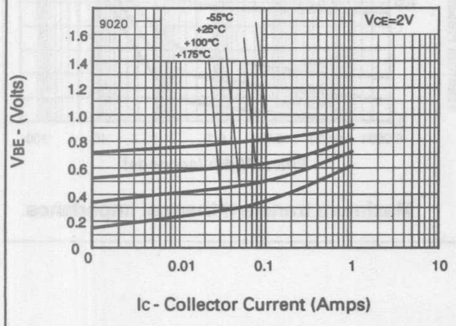
VCE(sat) v IC



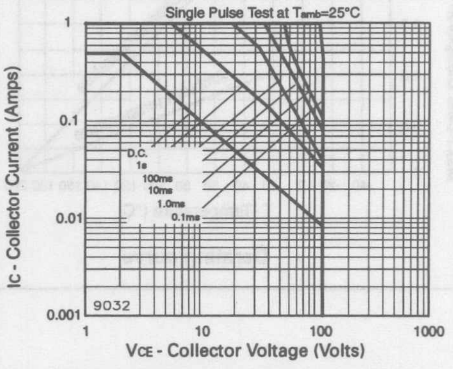
hFE v IC



VBE(sat) v IC



VBE(on) v IC



Safe Operating Area

NPN SILICON PLANAR MEDIUM POWER HIGH GAIN TRANSISTOR

ZTX696B

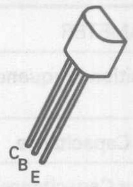
ISSUE 3 - NOVEMBER 1995

FEATURES

- 180 Volt V_{CEO}
- Gain of 500 at I_C=100mA
- Very low saturation voltage

APPLICATIONS

- Darlington replacement
- Battery powered circuits
- Motor drivers
- Relay / solenoid drivers



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	180	V
Collector-Emitter Voltage	V_{CEO}	180	V
Emitter-Base Voltage	V_{EBO}	5	V
Peak Pulse Current	I_{CM}	1	A
Continuous Collector Current	I_C	0.5	A
Practical Power Dissipation *	P_{totp}	1.5	W
Power Dissipation at T_{amb}=25°C derate above 25°C	P_{tot}	1 5.7	W mW/°C
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +200	°C

*The power which can be dissipated assuming the device is mounted in a typical manner on a P.C.B. with copper equal to 1 inch square minimum

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C)

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	180			V	I_C=100µA
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	180			V	I_C=10mA*
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	5			V	I_E=100µA
Collector Cut-Off Current	I_{CBO}			0.1	µA	V_{CB}=145V
Emitter Cut-Off Current	I_{EBO}			0.1	µA	V_{EB}=4V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$			0.2 0.2 0.25	V V V	I_C=50mA, I_B=0.5mA* I_C=100mA, I_B=2mA* I_C=200mA, I_B=5mA*
Base-Emitter Saturation Voltage	$V_{BE(sat)}$			0.9	V	I_C=200mA, I_B=5mA*
Base-Emitter Turn-On Voltage	$V_{BE(on)}$			0.9	V	I_C=200mA, V_{CE}=5V*
Static Forward Current Transfer Ratio	h_{FE}	500 150				I_C=100mA, V_{CE}=5V* I_C=200mA, V_{CE}=5V*

ZTX696B

ELECTRICAL CHARACTERISTICS (at $T_{amb} = 25°C$)

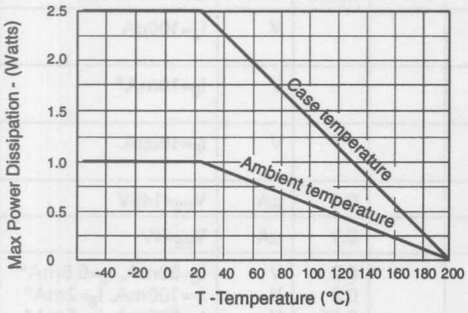
PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Transition Frequency	f_T	70			MHz	I_C=50mA, V_{CE}=5V f=50MHz
Input Capacitance	C_{ibo}		200		pF	V_{EB}=0.5V, f=1MHz
Output Capacitance	C_{obo}		6		pF	V_{CE}=10V, f=1MHz
Switching Times	t_{on} t_{off}		80 4400		ns ns	I_C=100mA, I_{BI}=10mA I_{B2}=10mA, V_{CC}=50V

*Measured under pulsed conditions. Pulse width=300µs. Duty cycle ≤2%

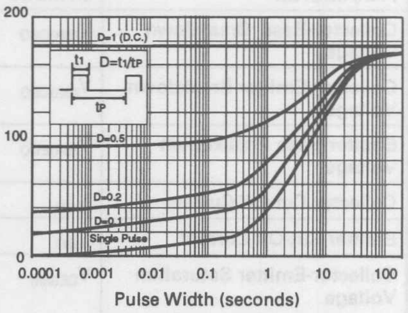
THERMAL CHARACTERISTICS

PARAMETER	SYMBOL	MAX.	UNIT
Thermal Resistance:Junction to Ambient$_1$	$R_{th(j-amb)1}$	175	°C/W
Junction to Ambient$_2$	$R_{th(j-amb)2}$†	116	°C/W
Junction to Case	$R_{th(j-case)}$	70	°C/W

† Device mounted on P.C.B. with copper equal to 1 sq. Inch minimum.



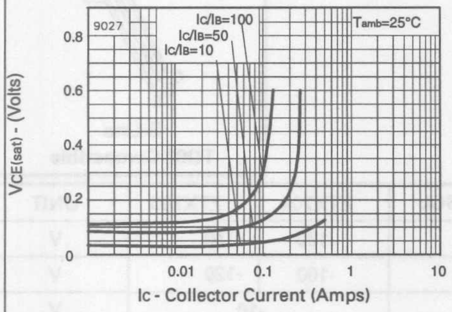
Derating curve



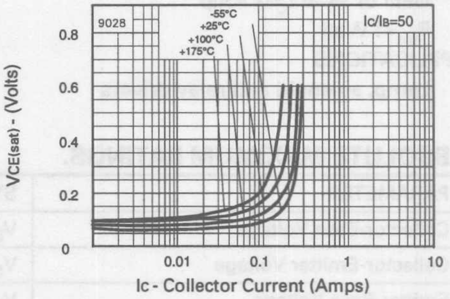
Maximum transient thermal impedance

ZTX696B

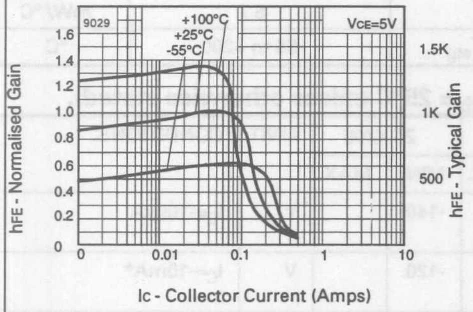
TYPICAL CHARACTERISTICS



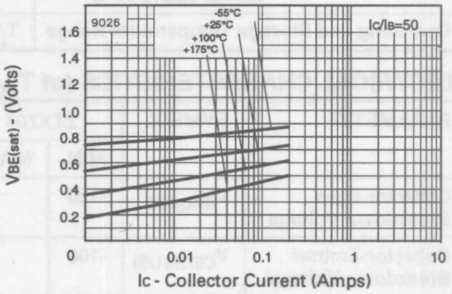
$V_{CE(sat)}$ v I_C



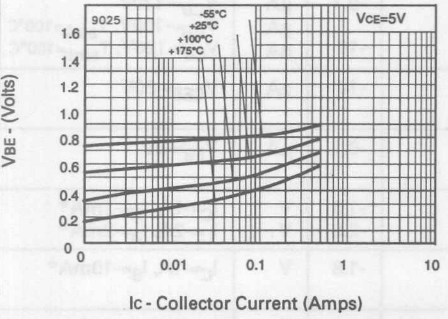
$V_{CE(sat)}$ v I_C



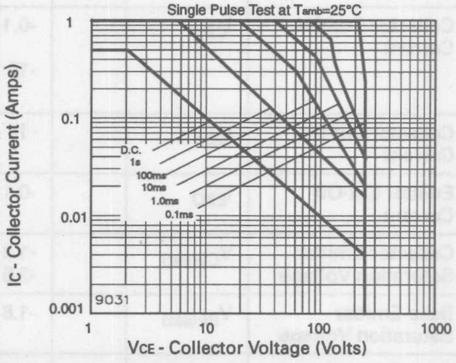
h_{FE} v I_C



$V_{BE(sat)}$ v I_C



$V_{BE(on)}$ v I_C



Safe Operating Area

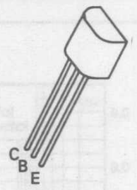
PNP SILICON PLANAR MEDIUM POWER DARLINGTON TRANSISTORS

ZTX704
ZTX705

ISSUE 3 – MAY 94

FEATURES
- 120 Volt V_{CEO}
- 1 Amp continuous current
- Gain of 3K at I_C=1 Amp
- P_{tot}=1 Watt

APPLICATIONS
- Lamp, solenoid and relay drivers



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	ZTX704	ZTX705	UNIT
Collector-Base Voltage	V_{CBO}	-120	-140	V
Collector-Emitter Voltage	V_{CEO}	-100	-120	V
Emitter-Base Voltage	V_{EBO}	-10		V
Peak Pulse Current	I_{CM}	-4		A
Continuous Collector Current	I_C	-1		A
Power Dissipation at T_{amb}= 25°C derate above 25°C	P_{tot}	1 5.7		W mW/ °C
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +200		°C

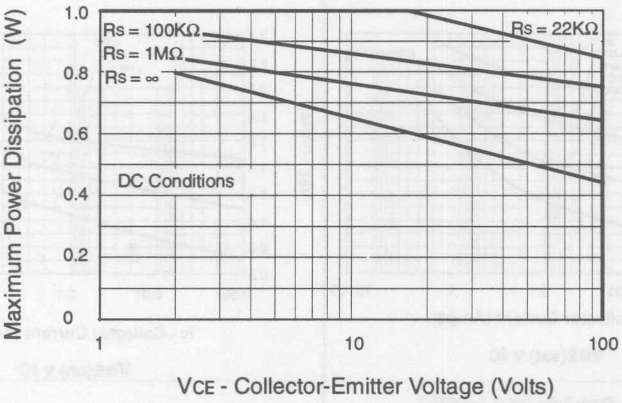
ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

PARAMETER	SYMBOL	ZTX704		ZTX705		UNIT	CONDITIONS.
		MIN.	MAX.	MIN.	MAX.		
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	-120		-140		V	I_C=-100µA
Collector-Emitter Breakdown Voltage	$V_{CEO(SUS)}$	-100		-120		V	I_C=-10mA*
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	-10		-10		V	I_E=-100µA
Collector Cut-Off Current	I_{CBO}		-0.1			µA	V_{CB}=-100V
					-0.1	µA	V_{CB}=-120V
			-10			µA	V_{CB}=-100V, T_{amb}=100°C
					-10	µA	V_{CB}=-120V, T_{amb}=100°C
Collector Cut-Off Current	I_{CES}		-10		-10	µA	V_{CES}=-80V
Emitter Cut-Off Current	I_{EBO}		-0.1		-0.1	µA	V_{EB}=-8V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$		-1.3		-1.3	V	I_C=-1A, I_B=-1mA*
			-2.5		-2.5	V	I_C=-2A, I_B=-2mA*
Base-Emitter Saturation Voltage	$V_{BE(sat)}$		-1.8		-1.8	V	I_C=-1A, I_B=-10mA*
Base-Emitter Turn-On Voltage	$V_{BE(on)}$		-1.7		-1.7	V	I_C=-1A, V_{CE}=-5V*

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C).

PARAMETER	SYMBOL	ZTX704		ZTX705		UNIT	CONDITIONS.
		MIN.	MAX.	MIN.	MAX.		
Static Forward Current Transfer Ratio	h_{FE}	3K 3K 3K 2K	30K	3K 3K 3K 2K	30K		I_C=-10mA, V_{CE}=-5V* I_C=-100mA, V_{CE}=-5V* I_C=-1A, V_{CE}=-5V* I_C=-2A, V_{CE}=-5V*
Transition Frequency	f_T	160 Typical		160 Typical		MHz	I_C=-100mA, V_{CE}=-10V f=20MHz
Input Capacitance	C_{ibo}	90 Typical		90 Typical		pF	V_{EB}=-0.5V, f=1MHz
Output Capacitance	C_{obo}	15 Typical		15 Typical		pF	V_{CE}=-10V, f=1MHz
Switching Times	t_{on}	0.6 Typical		0.6 Typical		μs	I_C=-0.5A, V_{CE}=-10V I_{B1}=I_{B2}=-0.5mA
	t_{off}	0.8 Typical		0.8 Typical		μs	

*Measured under pulsed conditions. Pulse width=300μs. Duty cycle ≤2%



Voltage Derating Graph

The maximum permissible operational temperature can be obtained from this graph using the following equation

$$T_{amb(max)} = \frac{Power(max) - Power(act)}{0.0057} + 25°C$$

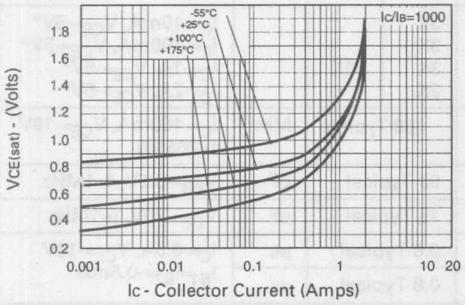
$T_{amb(max)}$= Maximum operating ambient temperature

Power(max) = Maximum power dissipation figure, obtained from the above graph for a given V_{CE} and source resistance (R_S)

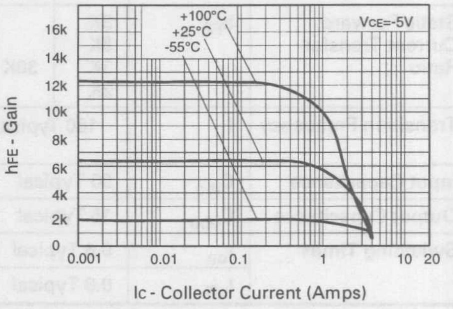
Power(actual)= Actual power dissipation in users circuit

ZTX704
ZTX705

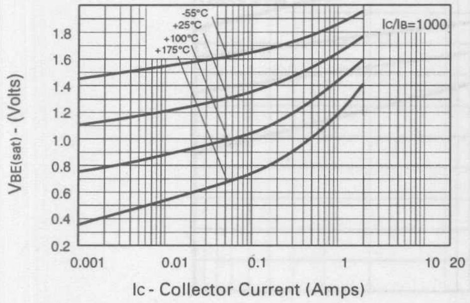
TYPICAL CHARACTERISTICS



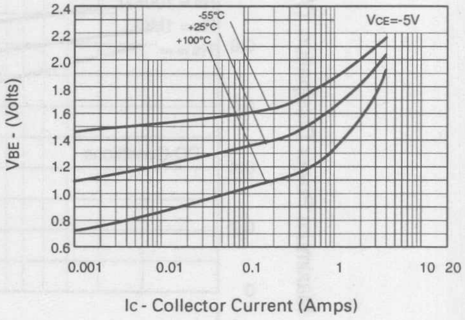
VCE(sat) v IC



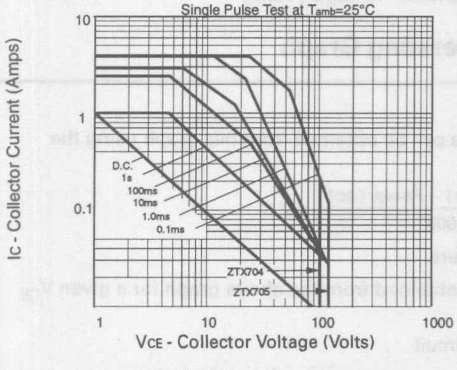
hFE v IC



VBE(sat) v IC



VBE(on) v IC



Safe Operating Area

PNP SILICON PLANAR MEDIUM POWER DARLINGTON TRANSISTOR

ZTX712

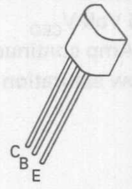
ISSUE 1 – MAY 94

FEATURES

- 60 Volt V_{CEO}
- 0.8 Amp continuous current
- Gain of 10K at I_C=0.5 Amp

APPLICATIONS

- Lamp, solenoid and relay drivers



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER		SYMBOL	VALUE	UNIT
Collector-Base Voltage		V_{CBO}	-80	V
Collector-Emitter Voltage		V_{CEO}	-60	V
Emitter-Base Voltage		V_{EBO}	-10	V
Peak Pulse Current		I_{CM}	-2	A
Continuous Collector Current		I_C	-800	mA
Power Dissipation	at T_{amb}= 25°C derate above 25°C	P_{tot}	1 5.7	W mW/ °C
Operating and Storage Temperature Range		T_j:T_{stg}	-55 to +200	°C

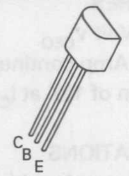
ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

PARAMETER	SYMBOL	MIN.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	-80		V	I_C=-10μA
Collector-Emitter Breakdown Voltage	$V_{CEO(SUS)}$	-60		V	I_C=-10mA*
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	-10		V	I_E=-10μA
Collector Cut-Off Current	I_{CBO}		-100	nA	V_{CB}=-60V, I_E=0
Emitter Cut-Off Current	I_{EBO}		-100	nA	V_{EB}=-8V, I_C=0
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$		-1.25	V	I_C=-800mA, I_B=-8mA*
Base-Emitter Turn-On Voltage	$V_{BE(on)}$		-1.8	V	I_C=-800mA, V_{CE}=-5V*
Static Forward Current Transfer Ratio	h_{FE}	5K 10K			I_C=-100mA, V_{CE}=-5V* I_C=-500mA, V_{CE}=-5V*

*Measured under pulsed conditions. Pulse width=300μs. Duty cycle ≤ 2%

FEATURES

- 25 Volt V_{CEO}
- 2 Amp continuous current
- Low saturation voltage



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	-35	V
Collector-Emitter Voltage	V_{CEO}	-25	V
Emitter-Base Voltage	V_{EBO}	-5	V
Peak Pulse Current	I_{CM}	-6	A
Continuous Collector Current	I_C	-2	A
Power Dissipation at T_{amb}=25°C derate above 25°C	P_{tot}	1 5.7	W mW/ °C
Operating and Storage Temperature Range	$T_j{:}T_{stg}$	-55 to +200	°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	-35			V	I_C=-100μA, I_E=0
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	-25			V	I_C=-10mA, I_B=0*
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	-5			V	I_E=-100μA, I_C=0
Collector Cut-Off Current	I_{CBO}			-0.1 -10	μA μA	V_{CB}=-30V V_{CB}=-30V,T_{amb}=100°C
Emitter Cut-Off Current	I_{EBO}			-0.1	μA	V_{EB}=-4V, I_E=0
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$		-0.12 -0.23	-0.3 -0.5	V V	I_C=1A, I_B=-100mA* I_C=2A, I_B=-200mA*
Base-Emitter Saturation Voltage	$V_{BE(sat)}$		-0.9	-1.25	V	I_C=1A, I_B=-100mA*
Base-Emitter Turn-On Voltage	$V_{BE(on)}$		-0.8	-1	V	I_C=-1A, V_{CE}=-2V*
Static Forward Current Transfer Ratio	h_{FE}	70 100 75 15	200 200 150 50	 300 		I_C=-50mA, V_{CE}=-2V* I_C=-1A, V_{CE}=-2V* I_C=-2A, V_{CE}=-2V* I_C=-6A, V_{CE}=-2V*

*Measured under pulsed conditions. Pulse width=300μs. Duty cycle ≤2%

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

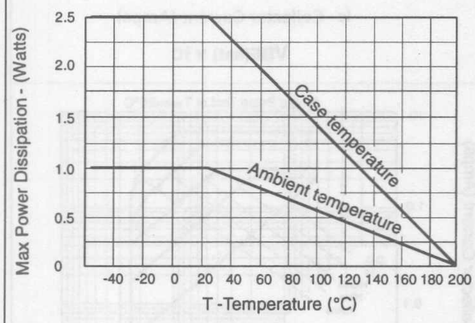
PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Transition Frequency	f_T	100	160		MHz	I_C=-100mA, V_{CE}=-5V f=100MHz
Output Cpacitance	C_{obo}		55	100	pF	V_{CB}=-10V f=1MHz
Switching Times	t_{on}		40		ns	I_C=-500mA, V_{CC}=-10V I_{B1}=I_{B2}=-50mA
	t_{off}		450		ns	

*Measured under pulsed conditions. Pulse width=300µs. Duty cycle ≤ 2%

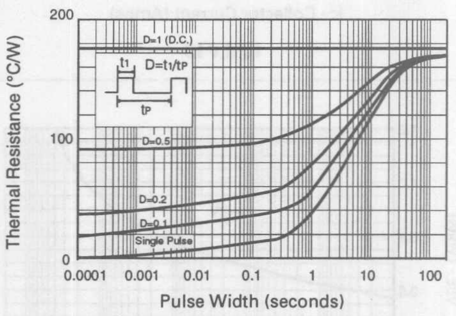
THERMAL CHARACTERISTICS

PARAMETER	SYMBOL	MAX.	UNIT
Thermal Resistance:Junction to Ambient$_1$	$R_{th(j-amb)1}$	175	°C/W
Junction to Ambient$_2$	$R_{th(j-amb)2}$†	116	°C/W
Junction to Case	$R_{th(j-case)}$	70	°C/W

† Device mounted on P.C.B. with copper equal to 1 sq. Inch minimum.

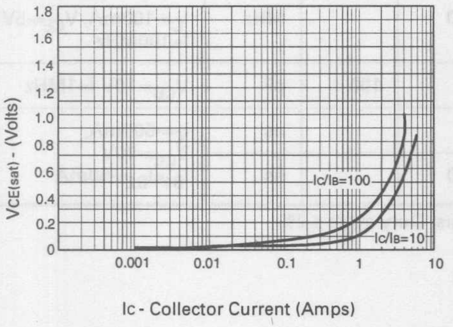


Derating curve

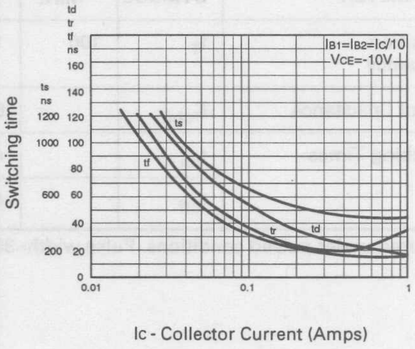


Maximum transient thermal impedance

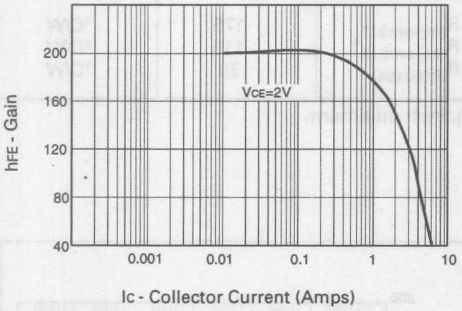
TYPICAL CHARACTERISTICS



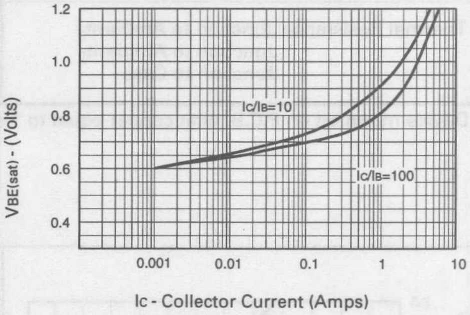
VCE(sat) v IC



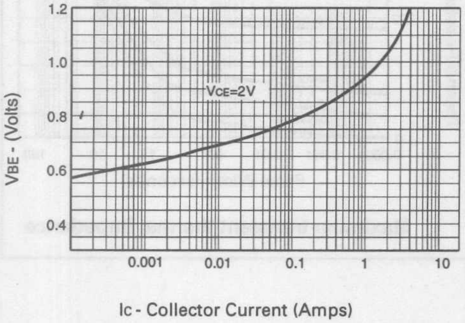
Switching Speeds



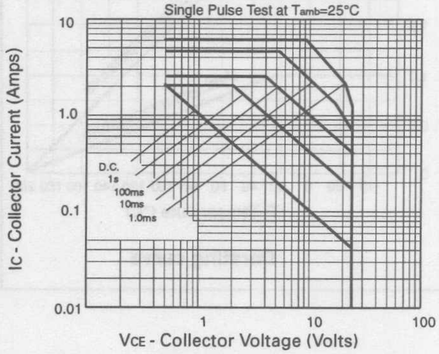
hFE v IC



VBE(sat) v IC



VBE(on) v IC



Safe Operating Area

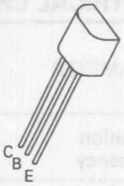
PNP SILICON PLANAR MEDIUM POWER TRANSISTORS

ZTX750
ZTX751

ISSUE 2 – JULY 94

FEATURES

- 60 Volt V_{CEO}
- 2 Amp continuous current
- Low saturation voltage
- P_{tot}= 1 Watt



E-Line

TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	ZTX750	ZTX751	UNIT
Collector-Base Voltage	V_{CBO}	-60	-80	V
Collector-Emitter Voltage	V_{CEO}	-45	-60	V
Emitter-Base Voltage	V_{EBO}	-5		V
Peak Pulse Current	I_{CM}	-6		A
Continuous Collector Current	I_C	-2		A
Power Dissipation: at T_{amb}=25°C derate above 25°C	P_{tot}	1 5.7		W mW/°C
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +200		°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

PARAMETER	SYMBOL	ZTX750			ZTX751			UNIT	CONDITIONS.
		MIN.	TYP.	MAX.	MIN.	TYP.	MAX.		
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	-60			-80			V	I_C=-100µA
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	-45			-60			V	I_C=-10mA
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	-5			-5			V	I_E=-100µA
Collector Cut-Off Current	I_{CBO}			-0.1 -10 			 -0.1 -10	µA µA µA µA	V_{CB}=-45V V_{CB}=-60V V_{CB}=-45V,T_{amb}=100°C V_{CB}=-60V,T_{amb}=100°C
Emitter Cut-Off Current	I_{EBO}			-0.1			-0.1	µA	V_{EB}=-4V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$		-0.15 -0.28	-0.3 -0.5		-0.15 -0.28	-0.3 -0.5	V V	I_C=-1A, I_B=-100mA I_C=-2A, I_B=-200mA
Base-Emitter Saturation Voltage	$V_{BE(sat)}$		-0.9	-1.25		-0.9	-1.25	V	I_C=-1A, I_B=-100mA
Base-Emitter Turn-On Voltage	$V_{BE(on)}$		-0.8	-1		-0.8	-1	V	I_C=-1A, V_{CE}=-2V
Static Forward Current Transfer Ratio	h_{FE}	70 100 80 40	200 200 170 80	 300 	70 100 80 40	200 200 170 80	 300 		I_C=-50mA, V_{CE}=-2V* I_C=-500mA,V_{CE}=-2V* I_C=-1A, V_{CE}=-2V* I_C=-2A, V_{CE}=-2V*

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

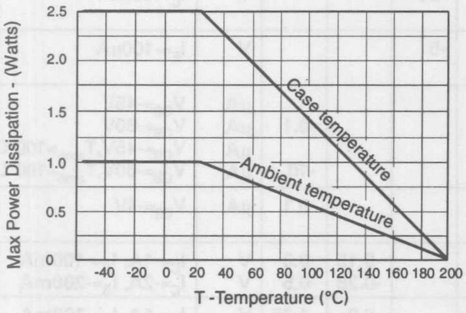
PARAMETER	SYMBOL	ZTX750			ZTX751			UNIT	CONDITIONS.
		MIN.	TYP.	MAX.	MIN.	TYP.	MAX.		
Transition Frequency	f_T	100	140		100	140		MHz	I_C=-100mA, V_{CE}=-5V f=100MHz
Switching Times	t_{on}		40			40		ns	I_C=-500mA, V_{CC}=-10V I_{B1}=I_{B2}=-50mA
	t_{off}		450			450		ns	
Output Capacitance	C_{obo}			30			30	pF	V_{CB}=10V f=1MHz

*Measured under pulsed conditions. Pulse width=300µs. Duty cycle ≤ 2%

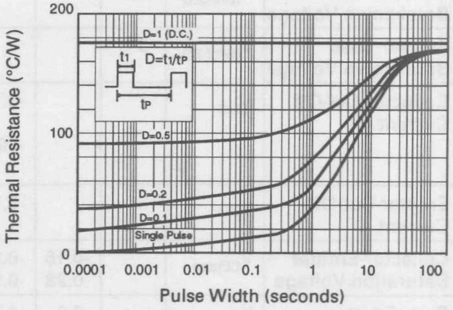
THERMAL CHARACTERISTICS

PARAMETER	SYMBOL	MAX.	UNIT
Thermal Resistance: Junction to Ambient$_1$	$R_{th(j-amb)1}$	175	°C/W
Junction to Ambient$_2$	$R_{th(j-amb)2}$†	116	°C/W
Junction to Case	$R_{th(j-case)}$	70	°C/W

† Device mounted on P.C.B. with copper equal to 1 sq. Inch minimum.



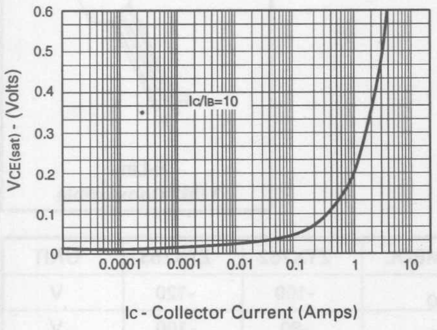
Derating curve



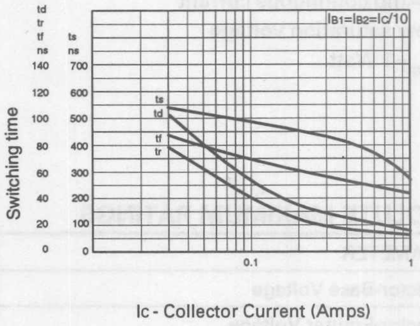
Maximum transient thermal impedance

ZTX750
ZTX751

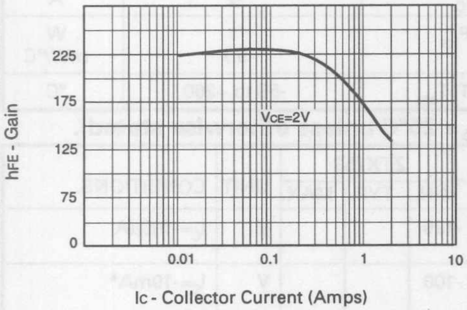
TYPICAL CHARACTERISTICS



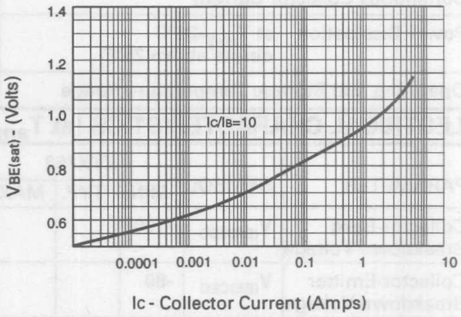
$V_{CE(sat)}$ v I_C



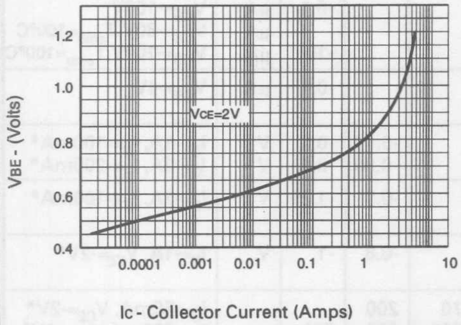
Switching Speeds



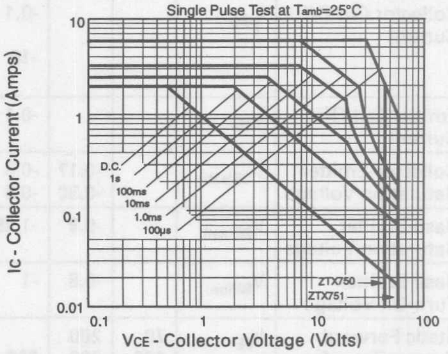
h_{FE} v I_C



$V_{BE(sat)}$ v I_C



$V_{BE(on)}$ v I_C



Safe Operating Area

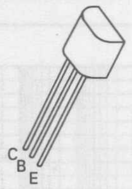
PNP SILICON PLANAR MEDIUM POWER TRANSISTORS

ISSUE 2 – JULY 94

ZTX752
ZTX753

FEATURES

- * 100 Volt V_{CEO}
- * 2 Amp continuous current
- * Low saturation voltage
- * P_{tot}=1 Watt



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER		SYMBOL	ZTX752	ZTX753	UNIT
Collector-Base Voltage		V_{CBO}	-100	-120	V
Collector-Emitter Voltage		V_{CEO}	-80	-100	V
Emitter-Base Voltage		V_{EBO}	-5		V
Peak Pulse Current		I_{CM}	-6		A
Continuous Collector Current		I_C	-2		A
Power Dissipation	at T_{amb}=25°C derate above 25°C	P_{tot}	1 5.7		W mW/°C
Operating and Storage Temperature Range		T_j:T_{stg}	-55 to +200		°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

PARAMETER	SYMBOL	ZTX752			ZTX753			UNIT	CONDITIONS.
		MIN.	TYP.	MAX.	MIN.	TYP.	MAX.		
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	-100			-120			V	I_C=-100µA
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	-80			-100			V	I_C=-10mA*
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	-5			-5			V	I_E=-100µA
Collector Cut-Off Current	I_{CBO}			-0.1				µA	V_{CB}=-80V
							-0.1	µA	V_{CB}=-100V
				-10				µA	V_{CB}=-80V,T_{amb}=100°C
							-10	µA	V_{CB}=-100V,T_{amb}=100°C
Emitter Cut-Off Current	I_{EBO}			-0.1			-0.1	µA	V_{EB}=-4V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$		-0.17 -0.30	-0.3 -0.5		-0.17 -0.30	-0.3 -0.5	V V	I_C=-1A, I_B=-100mA* I_C=-2A, I_B=-200mA*
Base-Emitter Saturation Voltage	$V_{BE(sat)}$		-0.9	-1.25		-0.9	-1.25	V	I_C=-1A, I_B=-100mA*
Base-Emitter Turn-On Voltage	$V_{BE(on)}$		-0.8	-1		-0.8	-1	V	I_C=-1A, V_{CE}=-2V*
Static Forward Current Transfer Ratio	h_{FE}	70	200		70	200			I_C=-50mA, V_{CE}=-2V*
		100	200	300	100	200	300		I_C=-500mA,V_{CE}=-2V*
		55	170		55	170			I_C=-1A, V_{CE}=-2V*
		25	55		25	55			I_C=-2A, V_{CE}=-2V*

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C).

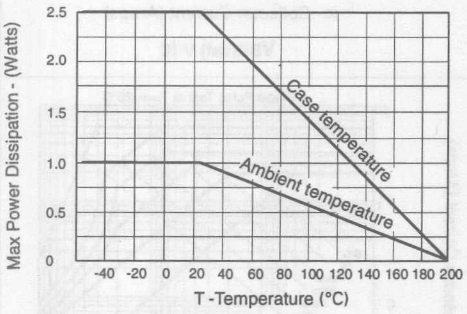
PARAMETER	SYMBOL	ZTX752			ZTX753			UNIT	CONDITIONS.
		MIN.	TYP.	MAX.	MIN.	TYP.	MAX.		
Transition Frequency	f_T	100	140		100	140		MHz	I_C=-100mA, V_{CE}=-5V f=100MHz
Switching Times	t_{on}		40			40		ns	I_C=-500mA, V_{CC}=-10V I_{B1}=I_{B2}=-50mA
	t_{off}		600			600		ns	
Output Capacitance	C_{obo}			30			30	pF	V_{CB}=10V f=1MHz

*Measured under pulsed conditions. Pulse width=300µs. Duty cycle ≤ 2%

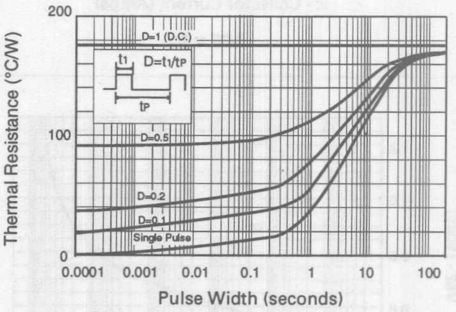
THERMAL CHARACTERISTICS

PARAMETER	SYMBOL	MAX.	UNIT
Thermal Resistance:Junction to Ambient$_1$	$R_{th(j\text{-}amb)1}$	175	°C/W
Junction to Ambient$_2$	$R_{th(j\text{-}amb)2}$†	116	°C/W
Junction to Case	$R_{th(j\text{-}case)}$	70	°C/W

† Device mounted on P.C.B. with copper equal to 1 sq. Inch minimum.



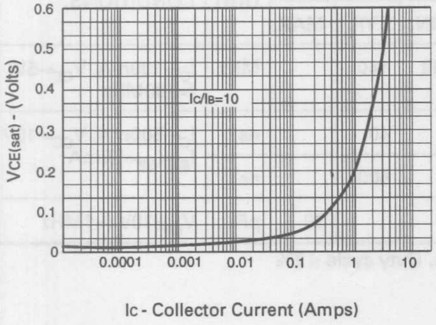
Derating curve



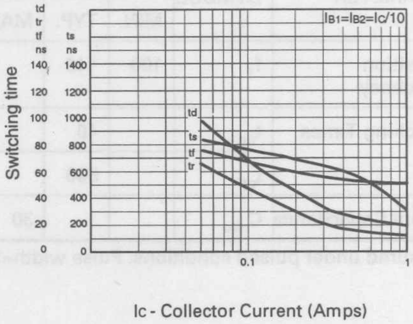
Maximum transient thermal impedance

ZTX752
ZTX753

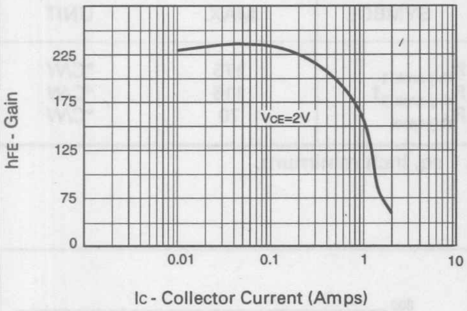
TYPICAL CHARACTERISTICS



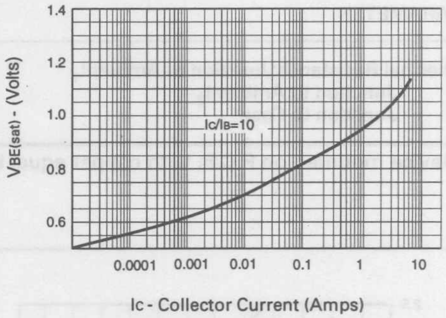
$V_{CE(sat)}$ v I_C



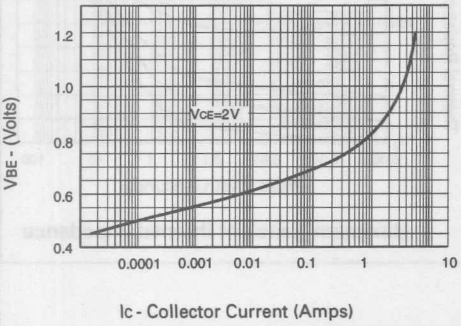
Switching Speeds



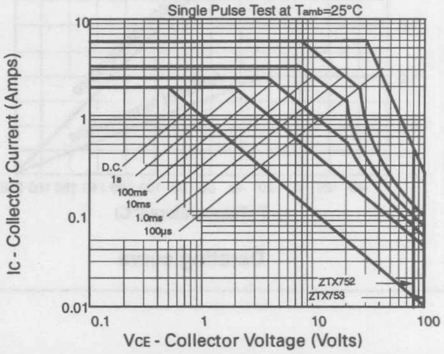
h_{FE} v I_C



$V_{BE(sat)}$ v I_C



$V_{BE(on)}$ v I_C



Safe Operating Area

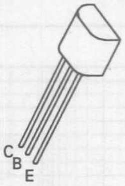
PNP SILICON PLANAR MEDIUM POWER TRANSISTORS

ISSUE 2 – JULY 94

ZTX754
ZTX755

FEATURES

- 150 Volt V_{CEO}
- 1 Amp continuous current
- Low saturation voltage
- P_{tot}= 1 Watt



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	ZTX754	ZTX755	UNIT
Collector-Base Voltage	V_{CBO}	-125	-150	V
Collector-Emitter Voltage	V_{CEO}	-125	-150	V
Emitter-Base Voltage	V_{EBO}	-5		V
Peak Pulse Current	I_{CM}	-2		A
Continuous Collector Current	I_C	-1		A
Power Dissipation at T_{amb}=25°C	P_{tot}	1		W
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +200		°C

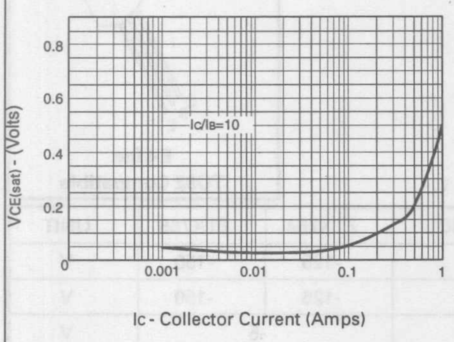
ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

PARAMETER	SYMBOL	ZTX754		ZTX755		UNIT	CONDITIONS.
		MIN.	MAX.	MIN.	MAX.		
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	-125		-150		V	I_C=-100μA, I_E=0
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	-125		-150		V	I_C=-10mA, I_B=0*
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	-5		-5		V	I_E=-100μA, I_C=0
Collector Cut-Off Current	I_{CBO}		-100		 -100	nA nA	V_{CB}=-100V, I_E=0 V_{CB}=-125V, I_E=0
Emitter Cut-Off Current	I_{EBO}		-100		-100	nA	V_{EB}=-3V, I_C=0
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$		-0.5 -0.5		-0.5 -0.5	V V	I_C=-500mA, I_B=-50mA* I_C=-1A, I_B=-200mA*
Base-Emitter Saturation Voltage	$V_{BE(sat)}$		-1.1		-1.1	V	I_C=-500mA, I_B=-50mA*
Base-Emitter Turn-On Voltage	$V_{BE(on)}$		-1.0		-1.0	V	I_C=-500mA, V_{CE}=-5V*
Static Forward Current Transfer Ratio	h_{FE}	50 50 20		50 50 20			I_C=-10mA, V_{CE}=-5V I_C=-500mA, V_{CE}=-5V* I_C=-1A, V_{CE}=-5V*
Transition Frequency	f_T	30		30		MHz	I_C=-10mA, V_{CE}=-20V f=20MHz
Output Capacitance	C_{obo}		20		20	pF	V_{CB}=-20V, f=1MHz

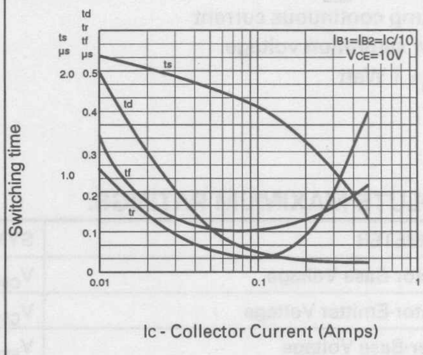
*Measured under pulsed conditions. Pulse width=300μs. Duty cycle ≤2%

ZTX754
ZTX755

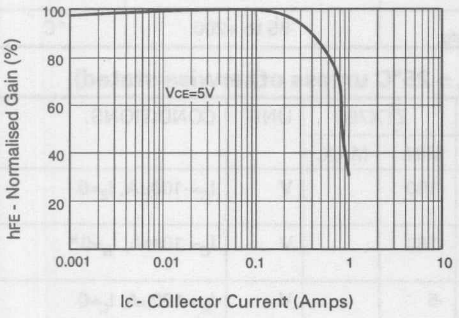
TYPICAL CHARACTERISTICS



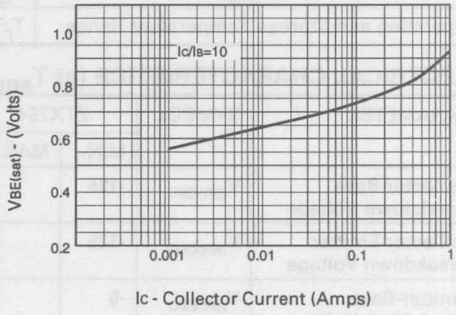
VCE(sat) v IC



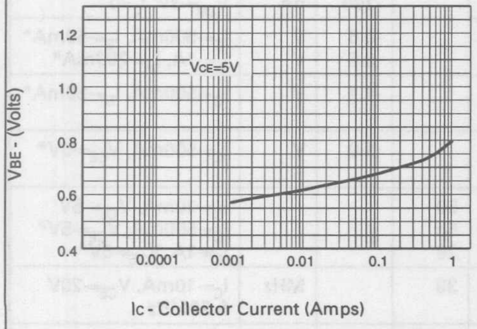
Switching Speeds



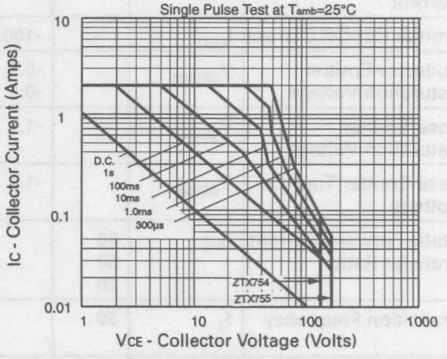
hFE v IC



VBE(sat) v IC



VBE(on) v IC



Safe Operating Area

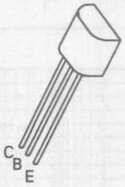
PNP SILICON PLANAR MEDIUM POWER HIGH VOLTAGE TRANSISTORS

ISSUE 2 – JULY 94

ZTX756
ZTX757

FEATURES

- 300 Volt V_{CEO}
- 0.5 Amp continuous current
- P_{tot}= 1 Watt



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	ZTX756	ZTX757	UNIT
Collector-Base Voltage	V_{CBO}	-200	-300	V
Collector-Emitter Voltage	V_{CEO}	-200	-300	V
Emitter-Base Voltage	V_{EBO}	-5		V
Peak Pulse Current	I_{CM}	-1		A
Continuous Collector Current	I_C	-0.5		A
Power Dissipation at T_{amb}=25°C	P_{tot}	1		W
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +200		°C

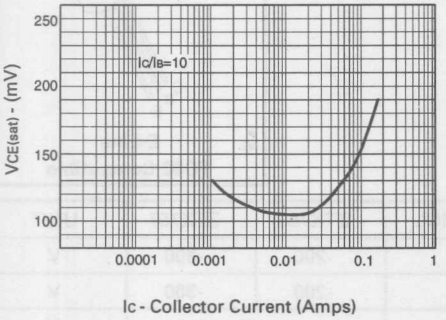
ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

PARAMETER	SYMBOL	ZTX756		ZTX757		UNIT	CONDITIONS.
		MIN.	MAX.	MIN.	MAX.		
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	-200		-300		V	I_C=-100μA, I_E=0
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	-200		-300		V	I_C=-10mA, I_B=0*
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	-5		-5		V	I_E=-100μA, I_C=0
Collector Cut-Off Current	I_{CBO}		-100		 -100	nA nA	V_{CB}=-160V, I_E=0 V_{CB}=-200V, I_E=0
Emitter Cut-Off Current	I_{EBO}		-100		-100	nA	V_{EB}=-3V, I_C=0
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$		-0.5		-0.5	V	I_C=-100mA, I_B=-10mA*
Base-Emitter Saturation Voltage	$V_{BE(sat)}$		-1.0		-1.0	V	I_C=-100mA, I_B=-10mA*
Base-Emitter Turn-On Voltage	$V_{BE(on)}$		-1.0		-1.0	V	I_C=-100mA, V_{CE}=-5V*
Static Forward Current Transfer Ratio	h_{FE}	50 40		50 40			I_C=-100mA, V_{CE}=-5V* I_C=-10mA, V_{CE}=-5V*
Transition Frequency	f_T	30		30		MHz	I_C=-10mA, V_{CE}=-20V f=20MHz
Output Capacitance	C_{obo}		20		20	pF	V_{CB}=-20V, f=1MHz

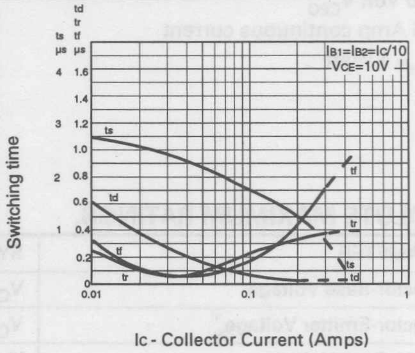
*Measured under pulsed conditions. Pulse width=300μs. Duty cycle ≤2%

ZTX756
ZTX757

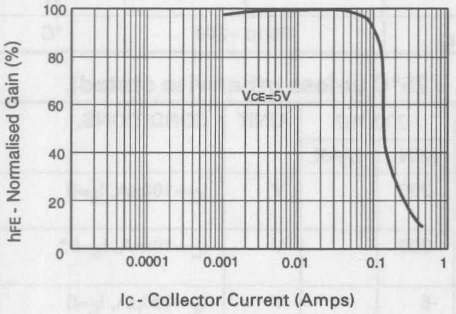
TYPICAL CHARACTERISTICS



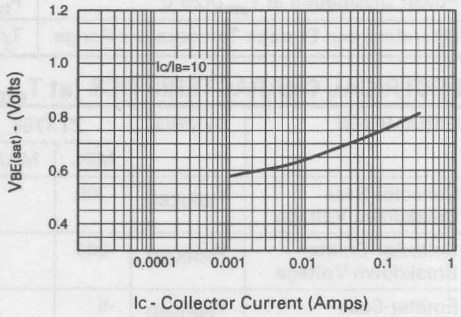
VCE(sat) v IC



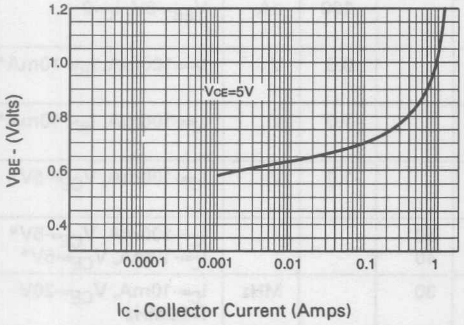
Switching Speeds



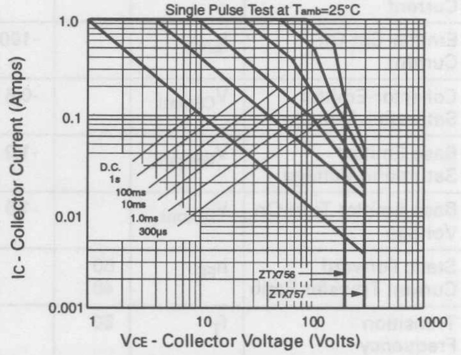
hFE v IC



VBE(sat) v IC



VBE(on) v IC



Safe Operating Area

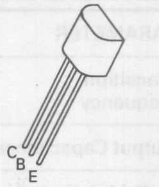
PNP SILICON PLANAR MEDIUM POWER HIGH VOLTAGE TRANSISTOR

ZTX758

ISSUE 1 – APRIL 94

FEATURES

- 400 Volt V_{CEO}
- 0.5 Amp continuous current
- P_{tot}=1 Watt



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	-400	V
Collector-Emitter Voltage	V_{CEO}	-400	V
Emitter-Base Voltage	V_{EBO}	-5	V
Peak Pulse Current	I_{CM}	-1	A
Continuous Collector Current	I_C	-500	mA
Power Dissipation at T_{amb}=25°C derate above 25°C	P_{tot}	1 5.7	W mW/ °C
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +200	°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	-400			V	I_C=-100µA
Collector-Emitter Breakdown Voltage	$V_{CEO(SUS)}$	-400			V	I_C=-10mA*
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	-5			V	I_E=-100µA
Collector Cut-Off Current	I_{CBO}			-100	nA	V_{CB}=-320V
Collector Cut-Off Current	I_{CES}			-100	nA	V_{CE}=-320V
Emitter Cut-Off Current	I_{EBO}			-100	nA	V_{EB}=-4V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$			-0.30 -0.25 -0.50	V V V	I_C=-20mA, I_B=-1mA I_C=-50mA, I_B=-5mA* I_C=-100mA, I_B=-10mA*
Base-Emitter Saturation Voltage	$V_{BE(sat)}$			-0.9	V	I_C=-100mA, I_B=-10mA*
Base-Emitter Turn On Voltage	$V_{BE(on)}$			-0.9	V	I_C=-100mA, V_{CE}=-5V*
Static Forward Current Transfer Ratio	h_{FE}	50 50 40				I_C=-1mA, V_{CE}=-5V I_C=-100mA, V_{CE}=-5V* I_C=-200mA, V_{CE}=-10V*

ZTX758

ELECTRICAL CHARACTERISTICS (at $T_{amb} = 25°C$)

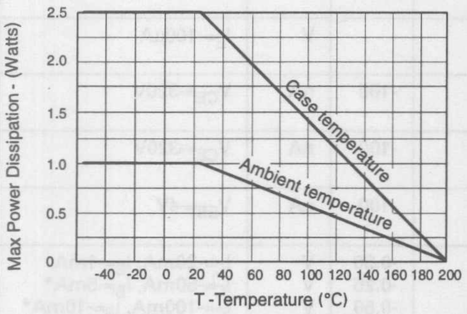
PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Transition Frequency	f_T	50			MHz	I_C=-20mA, V_{CE}=-20V f=20MHz
Output Capacitance	C_{obo}			20	pF	V_{CB}=-20V, f=1MHz
Switching times	t_{on} t_{off}		140 2000		ns ns	I_C=-100mA, V_C=-100V I_{B1}=10mA, I_{B2}=-20mA

* Measured under pulsed conditions. Pulse width=300µs. Duty cycle ≤2%

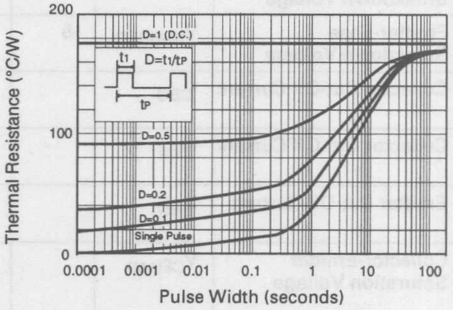
THERMAL CHARACTERISTICS

PARAMETER	SYMBOL	MAX.	UNIT
Thermal Resistance:Junction to Ambient$_1$	$R_{th(j-amb)1}$	175	°C/W
Junction to Ambient$_2$	$R_{th(j-amb)2}$ †	116	°C/W
Junction to Case	$R_{th(j-case)}$	70	°C/W

† Device mounted on P.C.B. with copper equal to 1 sq. Inch minimum.

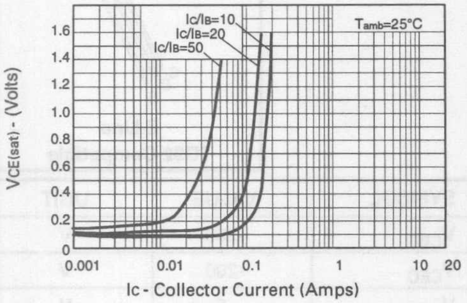


Derating curve

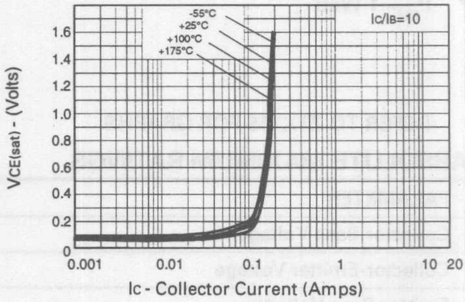


Maximum transient thermal impedance

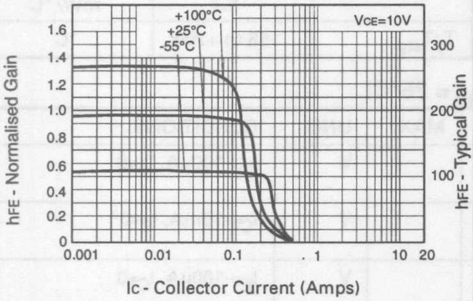
TYPICAL CHARACTERISTICS



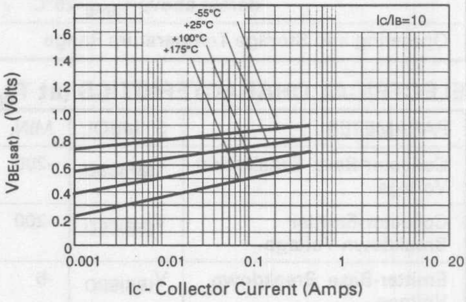
VCE(sat) v IC



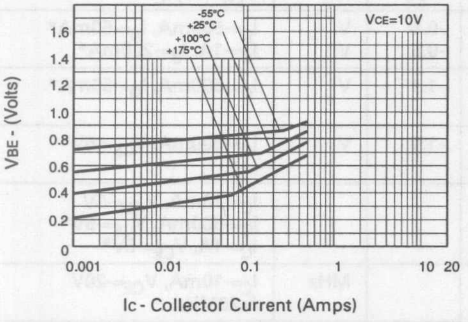
VCE(sat) v IC



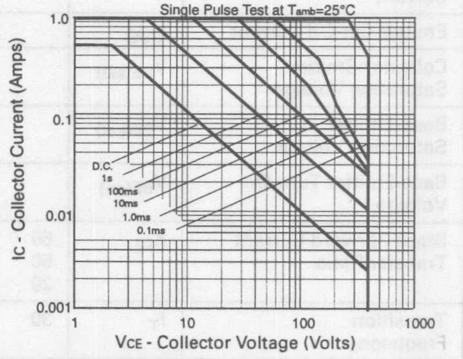
hFE v IC



VBE(sat) v IC



VBE(on) v IC



Safe Operating Area

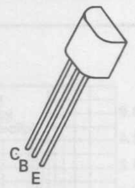
PNP SILICON PLANAR MEDIUM POWER TRANSISTOR

ISSUE 1 – JULY 94

ZTX776

FEATURES

- * 200 Volt V_{CEO}
- * 1 Amp continuous current
- * P_{tot}= 1 Watt



E-Line
TO92 Compatible

REFER TO ZTX755 FOR GRAPHS

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	-200	V
Collector-Emitter Voltage	V_{CEO}	-200	V
Emitter-Base Voltage	V_{EBO}	-5	V
Peak Pulse Current	I_{CM}	-2	A
Continuous Collector Current	I_C	-1	A
Power Dissipation at T_{amb}=25°C derate above T_{amb}=25°C	P_{tot}	1 5.7	W mW/ °C
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +200	°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C).

PARAMETER	SYMBOL	MIN.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	-200		V	I_C=-100μA, I_E=0
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	-200		V	I_C=-10mA, I_B=0*
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	-5		V	I_E=-100μA, I_C=0
Collector Cut-Off Current	I_{CBO}		-100	nA	V_{CB}=-160V, I_E=0
Emitter Cut-Off Current	I_{EBO}		-100	nA	V_{EB}=-4V, I_C=0
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$		-0.5 -0.5	V V	I_C=-500mA, I_B=-50mA* I_C=-1A, I_B=-200mA*
Base-Emitter Saturation Voltage	$V_{BE(sat)}$		-1.1	V	I_C=-500mA, I_B=-50mA*
Base-Emitter Turn-On Voltage	$V_{BE(on)}$		-1.0	V	I_C=-500mA, V_{CE}=-5V*
Static Forward Current Transfer Ratio	h_{FE}	50 50 20			I_C=-10mA, V_{CE}=-5V I_C=-500mA, V_{CE}=-5V* I_C=-1A, V_{CE}=-5V*
Transition Frequency	f_T	30		MHz	I_C=-10mA, V_{CE}=-20V f=20MHz
Output Capacitance	C_{obo}		20	pF	V_{CB}=-20V, f=1MHz

*Measured under pulsed conditions. Pulse width=300μs. Duty cycle ≤2%

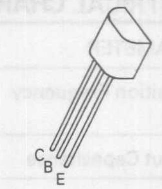
PNP SILICON PLANAR MEDIUM POWER HIGH GAIN TRANSISTOR

ZTX788A

PROVISIONAL DATASHEET ISSUE 2 – SEPTEMBER 94

FEATURES

- 15 Volt V_{CEO}
- Gain of 200 at I_C=2 Amps
- Very low saturation voltage



E-Line

TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	-20	V
Collector-Emitter Voltage	V_{CEO}	-15	V
Emitter-Base Voltage	V_{EBO}	-5	V
Peak Pulse Current	I_{CM}	-10	A
Continuous Collector Current	I_C	-3	A
Practical Power Dissipation*	P_{totp}	1.5	W
Power Dissipation at T_{amb}=25°C derate above 25°C	P_{tot}	1 5.7	W mW/°C
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +200	°C

*The power which can be dissipated assuming the device is mounted in a typical manner on a P.C.B. with copper equal to 1 inch square minimum

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C)

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	-20	-30		V	I_C=-100μA
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	-15	-20		V	I_C=-10mA*
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	-5	-8.5		V	I_E=-100μA
Collector Cut-Off Current	I_{CBO}			-0.1 -10	μA μA	V_{CB}=-10V V_{CB}=-10V, T_{amb}=100°C
Emitter Cut-Off Current	I_{EBO}			-0.1	μA	V_{EB}=-4V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$		-0.025 -0.25 -0.28	-0.035 -0.32 -0.33	V V V	I_C=-0.1A, I_B=-2mA* I_C=-2A, I_B=-20mA* I_C=-3A, I_B=-200mA*
Base-Emitter Saturation Voltage	$V_{BE(sat)}$		-0.85	-1.0	V	I_C=-2A, I_B=-20mA*
Base-Emitter Turn-On Voltage	$V_{BE(on)}$		-0.8		V	I_C=-2A, V_{CE}=-3V*
Static Forward Current Transfer Ratio	h_{FE}	300 250 200 80		800		I_C=-10mA, V_{CE}=-1V* I_C=-1A, V_{CE}=-1V* I_C=-2A, V_{CE}=-1V* I_C=-10A, V_{CE}=-2V*

ZTX788A

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C)

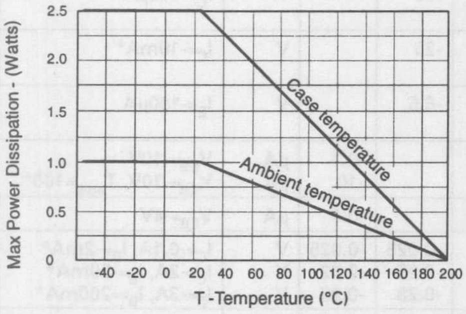
PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Transition Frequency	f_T	100	150		MHz	I_C=-50mA, V_{CE}=-5V f=50MHz
Output Capacitance	C_{obo}		30	60	pF	V_{CB}=-10V, f=1MHz
Switching Times	t_{on} t_{off}		40 500		ns ns	I_C=-500mA, I_{B1}=-50mA I_{B2}=-50mA, V_{CC}=-10V

*Measured under pulsed conditions. Pulse width=300μs. Duty cycle ≤2%

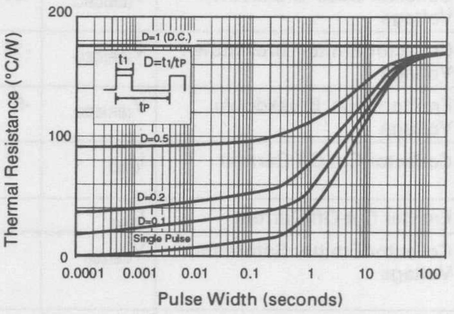
THERMAL CHARACTERISTICS

PARAMETER	SYMBOL	MAX.	UNIT
Thermal Resistance:Junction to Ambient$_1$	$R_{th(j\text{-}amb)1}$	175	°C/W
Junction to Ambient$_2$	$R_{th(j\text{-}amb)2}$†	116	°C/W
Junction to Case	$R_{th(j\text{-}case)}$	70	°C/W

† Device mounted on P.C.B. with copper equal to 1 sq. Inch minimum.



Derating curve

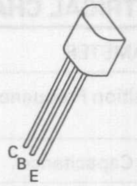


Maximum transient thermal impedance

PNP SILICON PLANAR MEDIUM POWER HIGH GAIN TRANSISTOR

ZTX788B

ISSUE 2 – APRIL 94



E-Line
TO92 Compatible

FEATURES

- 15 Volt V_{CEO}
- Gain of 300 at I_C=2 Amps
- Very low saturation voltage

APPLICATIONS

- Darlington replacement
- Flash gun convertors
- Battery powered circuits
- Motor drivers

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	-15	V
Collector-Emitter Voltage	V_{CEO}	-15	V
Emitter-Base Voltage	V_{EBO}	-5	V
Peak Pulse Current	I_{CM}	-8	A
Continuous Collector Current	I_C	-3	A
Practical Power Dissipation*	P_{totp}	1.5	W
Power Dissipation at T_{amb}=25°C derate above 25°C	P_{tot}	1 5.7	W mW/°C
Operating and Storage Temperature Range	tj:tstg	-55 to +200	°C

*The power which can be dissipated assuming the device is mounted in a typical manner on a P.C.B. with copper equal to 1 inch square minimum

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C)

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	-15			V	I_C=-100μA
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	-15			V	I_C=-10mA*
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	-5			V	I_E=-100μA
Collector Cut-Off Current	I_{CBO}			-0.1	μA	V_{CB}=-10V
Emitter Cut-Off Current	I_{EBO}			-0.1	μA	V_{EB}=-4V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$			-0.15 -0.25 -0.45	V V V	I_C=-0.5A, I_B=-2.5mA* I_C=-1A, I_B=-5mA* I_C=-2A, I_B=-10mA*
Base-Emitter Saturation Voltage	$V_{BE(sat)}$			-0.9	V	I_C=-1A, I_B=-5mA*
Base-Emitter Turn-On Voltage	$V_{BE(on)}$		-0.75		V	I_C=-1A, V_{CE}=-2V*
Static Forward Current Transfer Ratio	h_{FE}	500 400 300 150		1500		I_C=-10mA, V_{CE}=-2V* I_C=-1A, V_{CE}=-2V* I_C=-2A, V_{CE}=-2V* I_C=-6A, V_{CE}=-2V*

ZTX788B

ELECTRICAL CHARACTERISTICS (at $T_{amb} = 25°C$)

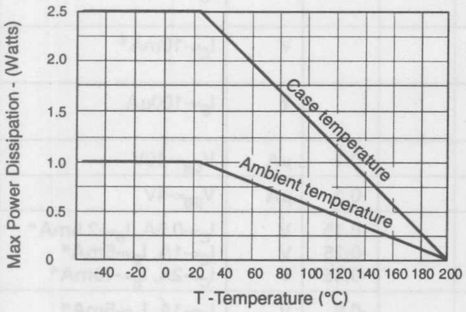
PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Transition Frequency	f_T	100			MHz	I_C=-50mA, V_{CE}=-5V f=50MHz
Input Capacitance	C_{ibo}		225		pF	V_{EB}=-0.5V, f=1MHz
Output Capacitance	C_{obo}		25		pF	V_{CB}=-10V, f=1MHz
Switching Times	t_{on} t_{off}		35 400		ns ns	I_C=-500mA, I_{B1}=-50mA I_{B2}=-50mA, V_{CC}=-10V

*Measured under pulsed conditions. Pulse width=300µs. Duty cycle ≤2%

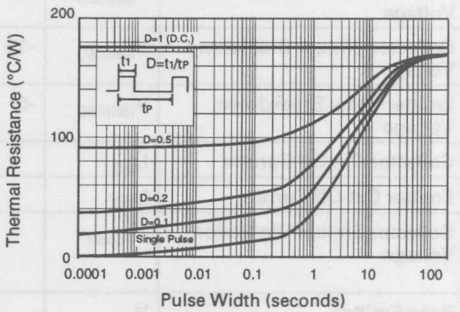
THERMAL CHARACTERISTICS

PARAMETER	SYMBOL	MAX.	UNIT
Thermal Resistance: Junction to Ambient$_1$	$R_{th(j-amb)1}$	175	°C/W
Junction to Ambient$_2$	$R_{th(j-amb)2}$†	116	°C/W
Junction to Case	$R_{th(j-case)}$	70	°C/W

† Device mounted on P.C.B. with copper equal to 1 sq. Inch minimum.

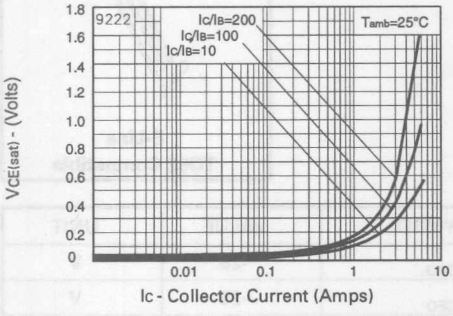


Derating curve

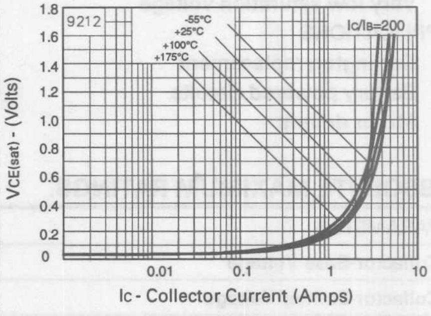


Maximum transient thermal impedance

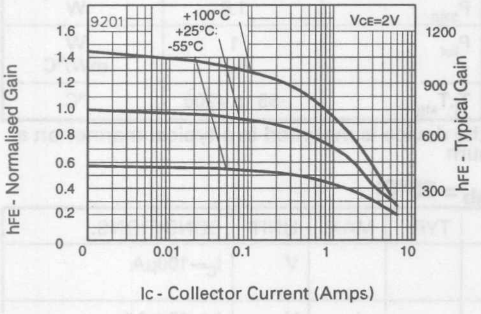
TYPICAL CHARACTERISTICS



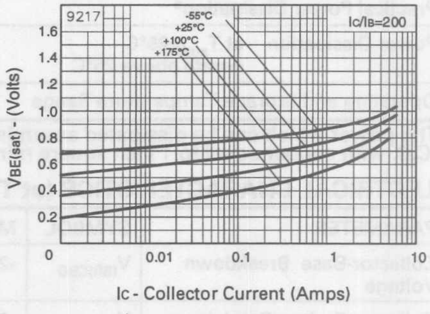
VCE(sat) v IC



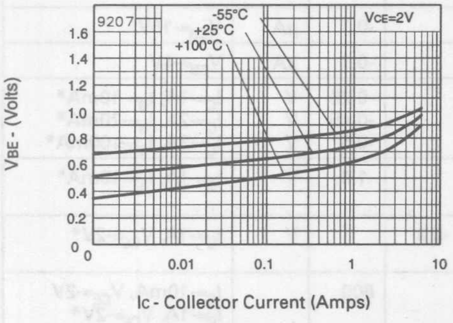
VCE(sat) v IC



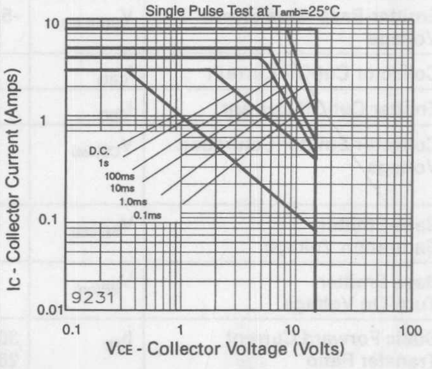
hFE v IC



VBE(sat) v IC



VBE(on) v IC



Safe Operating Area

PNP SILICON PLANAR MEDIUM POWER HIGH GAIN TRANSISTOR

ZTX789A

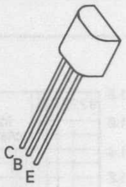
ISSUE 2 – APRIL 94

FEATURES

- 25 Volt V_{CEO}
- Gain of 200 at I_C=2 Amps
- Very low saturation voltage

APPLICATIONS

- Darlington replacement
- Battery powered circuits
- Motor drivers



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	-25	V
Collector-Emitter Voltage	V_{CEO}	-25	V
Emitter-Base Voltage	V_{EBO}	-5	V
Peak Pulse Current	I_{CM}	-8	A
Continuous Collector Current	I_C	-3	A
Practical Power Dissipation*	P_{totp}	1.5	W
Power Dissipation at T_{amb}=25°C derate above 25°C	P_{tot}	1 5.7	W mW/°C
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +200	°C

*The power which can be dissipated assuming the device is mounted in a typical manner on a P.C.B. with copper equal to 1 inch square minimum

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C)

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	-25			V	I_C=-100μA
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	-25			V	I_C=-10mA*
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	-5			V	I_E=-100μA
Collector Cut-Off Current	I_{CBO}			-0.1	μA	V_{CB}=-15V
Emitter Cut-Off Current	I_{EBO}			-0.1	μA	V_{EB}=-4V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$			-0.25 -0.45 -0.5	V V V	I_C=-1A, I_B=-10mA* I_C=-2A, I_B=-20mA* I_C=-3A, I_B=-100mA*
Base-Emitter Saturation Voltage	$V_{BE(sat)}$			-1.0	V	I_C=-1A, I_B=-10mA*
Base-Emitter Turn-On Voltage	$V_{BE(on)}$		-0.8		V	I_C=-1A, V_{CE}=-2V*
Static Forward Current Transfer Ratio	h_{FE}	300 250 200 100		800		I_C=-10mA, V_{CE}=-2V I_C=-1A, V_{CE}=-2V* I_C=-2A, V_{CE}=-2V* I_C=-6A, V_{CE}=-2V*

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C)

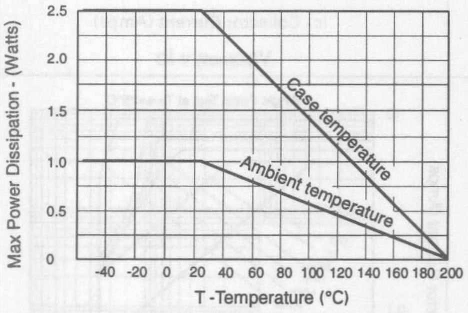
PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Transition Frequency	f_T	100			MHz	I_C=-50mA, V_{CE}=-5V f=50MHz
Input Capacitance	C_{ibo}		225		pF	V_{EB}=-0.5V, f=1MHz
Output Capacitance	C_{obo}		25		pF	V_{CB}=-10V, f=1MHz
Switching Times	t_{on} t_{off}		35 400		ns ns	I_C=-500mA, I_{B1}=-50mA I_{B2}=-50mA, V_{CC}=-10V

*Measured under pulsed conditions. Pulse width=300μs. Duty cycle ≤2%

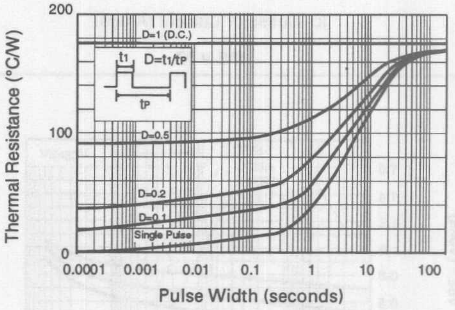
THERMAL CHARACTERISTICS

PARAMETER	SYMBOL	MAX.	UNIT
Thermal Resistance: Junction to Ambient$_1$	$R_{th(j\text{-}amb)1}$	175	°C/W
Junction to Ambient$_2$	$R_{th(j\text{-}amb)2}$†	116	°C/W
Junction to Case	$R_{th(j\text{-}case)}$	70	°C/W

† Device mounted on P.C.B. with copper equal to 1 sq. Inch minimum.

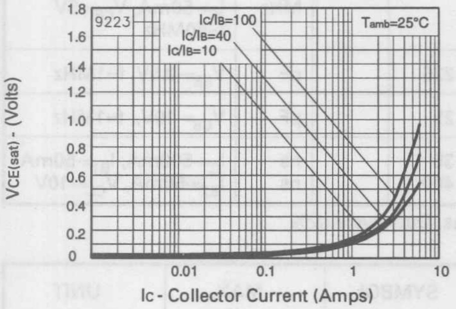


Derating curve

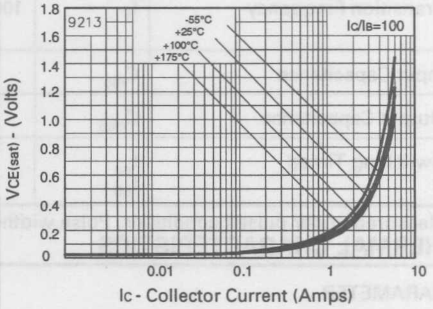


Maximum transient thermal impedance

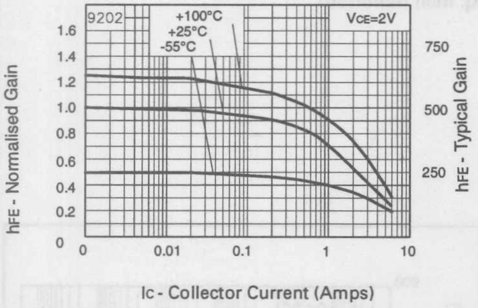
TYPICAL CHARACTERISTICS



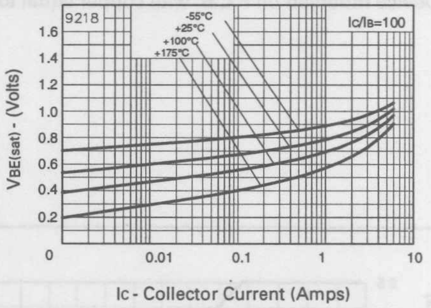
VCE(sat) v IC



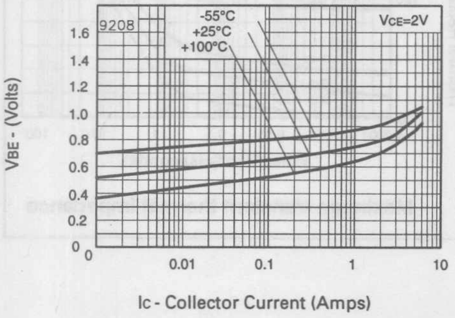
VCE(sat) v IC



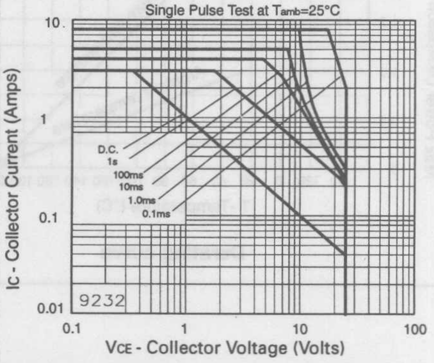
hFE v IC



VBE(sat) v IC



VBE(on) v IC



Safe Operating Area

PNP SILICON PLANAR MEDIUM POWER HIGH GAIN TRANSISTOR

ZTX790A

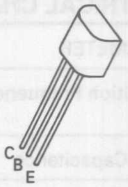
ISSUE 2 – APRIL 94

FEATURES

- 40 Volt V_{CEO}
- Gain of 200 at I_C=1 Amps
- Very low saturation voltage

APPLICATIONS

- Darlington replacement
- Siren driver
- Battery powered circuits
- Motor drivers



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	-50	V
Collector-Emitter Voltage	V_{CEO}	-40	V
Emitter-Base Voltage	V_{EBO}	-5	V
Peak Pulse Current	I_{CM}	-6	A
Continuous Collector Current	I_C	-2	A
Practical Power Dissipation*	P_{totp}	1.5	W
Power Dissipation at T_{amb}=25°C derate above 25°C	P_{tot}	1 5.7	W mW/°C
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +200	°C

*The power which can be dissipated assuming the device is mounted in a typical manner on a P.C.B. with copper equal to 1 inch square minimum

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C)

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	-50			V	I_C=-100μA
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	-40			V	I_C=-10mA*
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	-5			V	I_E=-100μA
Collector Cut-Off Current	I_{CBO}			-0.1	μA	V_{CB}=-30V
Emitter Cut-Off Current	I_{EBO}			-0.1	μA	V_{EB}=-4V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$			-0.25 -0.45 -0.75	V V V	I_C=-500mA, I_B=-5mA* I_C=-1A, I_B=-10mA* I_C=-2A, I_B=-50mA*
Base-Emitter Saturation Voltage	$V_{BE(sat)}$			-1.0	V	I_C=-1A, I_B=-10mA*
Base-Emitter Turn-On Voltage	$V_{BE(on)}$		-0.75		V	I_C=-1A, V_{CE}=-2V*
Static Forward Current Transfer Ratio	h_{FE}	300 250 200 150		800		I_C=-10mA, V_{CE}=-2V I_C=-500mA, V_{CE}=-2V* I_C=-1A, V_{CE}=-2V* I_C=-2A, V_{CE}=-2V*

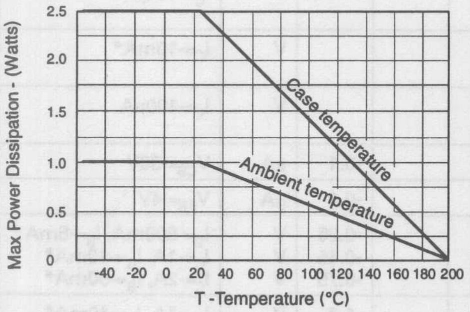
PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Transition Frequency	f_T	100			MHz	I_C=-50mA, V_{CE}=-5V f=50MHz
Input Capacitance	C_{ibo}		225		pF	V_{EB}=-0.5V, f=1MHz
Output Capacitance	C_{obo}		24		pF	V_{CB}=-10V, f=1MHz
Switching Times	t_{on} t_{off}		35 600		ns ns	I_C=-500mA, I_{B1}=-50mA I_{B2}=-50mA, V_{CC}=-10V

*Measured under pulsed conditions. Pulse width=300µs. Duty cycle ≤2%

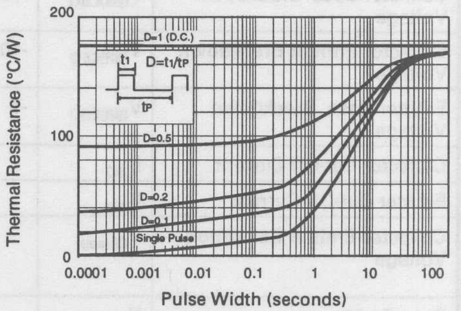
THERMAL CHARACTERISTICS

PARAMETER	SYMBOL	MAX.	UNIT
Thermal Resistance: Junction to Ambient$_1$	$R_{th(j\text{-}amb)1}$	175	°C/W
Junction to Ambient$_2$	$R_{th(j\text{-}amb)2}$†	116	°C/W
Junction to Case	$R_{th(j\text{-}case)}$	70	°C/W

† Device mounted on P.C.B. with copper equal to 1 sq. Inch minimum.

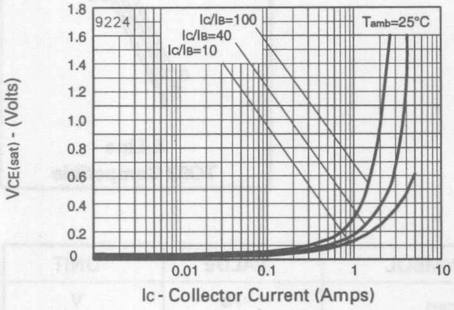


Derating curve

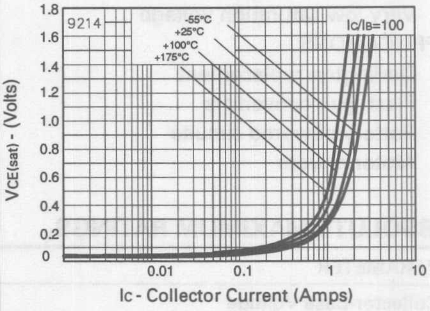


Maximum transient thermal impedance

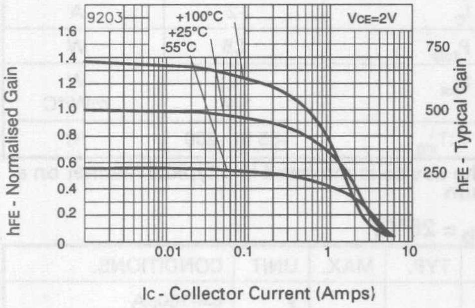
TYPICAL CHARACTERISTICS



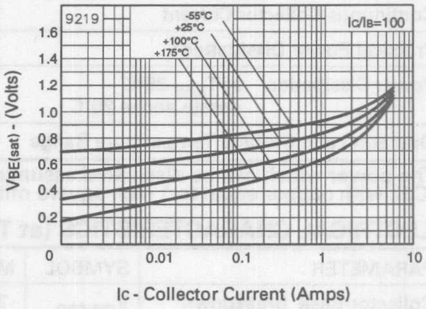
VCE(sat) v IC



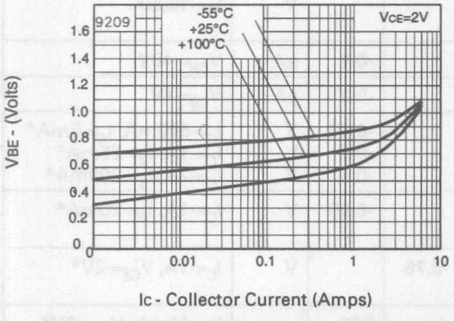
VCE(sat) v IC



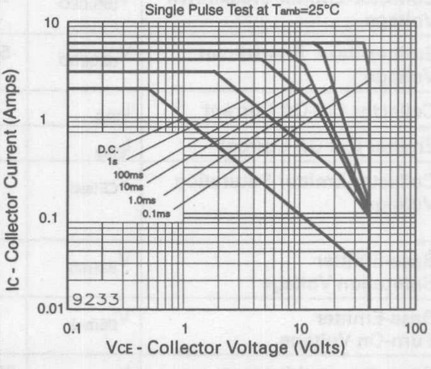
hFE v IC



VBE(sat) v IC



VBE(on) v IC



Safe Operating Area

PNP SILICON PLANAR MEDIUM POWER HIGH GAIN TRANSISTOR

ZTX792A

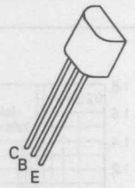
ISSUE 2 – APRIL 94

FEATURES

- 70 Volt V_{CEO}
- Gain of 400 at I_C=3 Amps
- Very low saturation voltage

APPLICATIONS

- Darlington replacement
- Flash gun convertors
- Battery powered circuits
- Motor drivers



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	-75	V
Collector-Emitter Voltage	V_{CEO}	-70	V
Emitter-Base Voltage	V_{EBO}	-5	V
Peak Pulse Current	I_{CM}	-4	A
Continuous Collector Current	I_C	-2	A
Practical Power Dissipation*	P_{totp}	1.5	W
Power Dissipation at T_{amb}=25°C derate above 25°C	P_{tot}	1 5.7	W mW/°C
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +200	°C

*The power which can be dissipated assuming the device is mounted in a typical manner on a P.C.B. with copper equal to 1 inch square minimum

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C)

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	-75			V	I_C=-100μA
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	-70			V	I_C=-10mA*
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	-5			V	I_E=-100μA
Collector Cut-Off Current	I_{CBO}			-0.1	μA	V_{CB}=-40V
Emitter Cut-Off Current	I_{EBO}			-0.1	μA	V_{EB}=-4V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$			-0.45 -0.5 -0.5	V V V	I_C=-500mA, I_B=-5mA* I_C=-1A, I_B=-25mA* I_C=-2A, I_B=-200mA*
Base-Emitter Saturation Voltage	$V_{BE(sat)}$			-0.95	V	I_C=-1A, I_B=-25mA*
Base-Emitter Turn-On Voltage	$V_{BE(on)}$		-0.75		V	I_C=-1A, V_{CE}=-2V*
Static Forward Current Transfer	h_{FE}	300 250 200		800		I_C=-10mA, V_{CE}=-2V* I_C=-500mA, V_{CE}=-2V* I_C=-1A, V_{CE}=-2V*

ELECTRICAL CHARACTERISTICS (at $T_{amb} = 25°C$)

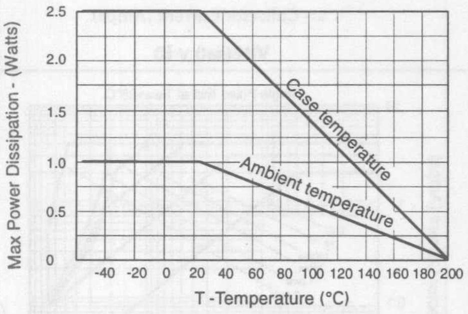
PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Transition Frequency	f_T	100			MHz	I_C=-50mA, V_{CE}=-5V f=50MHz
Input Capacitance	C_{ibo}		225		pF	V_{EB}=-0.5V, f=1MHz
Output Capacitance	C_{obo}		22		pF	V_{CB}=-10V, f=1MHz
Switching Times	t_{on} t_{off}		35 750		ns ns	I_C=-500mA, I_{B1}=-50mA I_{B2}=-50mA, V_{CC}=-10V

*Measured under pulsed conditions. Pulse width=300µs. Duty cycle ≤2%

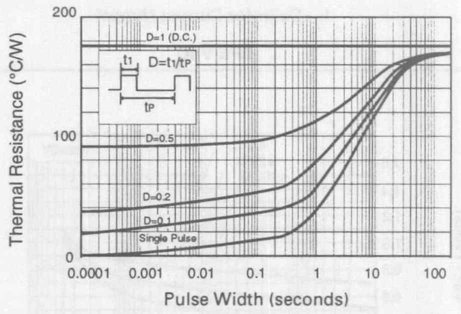
THERMAL CHARACTERISTICS

PARAMETER	SYMBOL	MAX.	UNIT
Thermal Resistance: Junction to Ambient$_1$	$R_{th(j-amb)1}$	175	°C/W
Junction to Ambient$_2$	$R_{th(j-amb)2}$†	116	°C/W
Junction to Case	$R_{th(j-case)}$	70	°C/W

† Device mounted on P.C.B. with copper equal to 1 sq. Inch minimum.

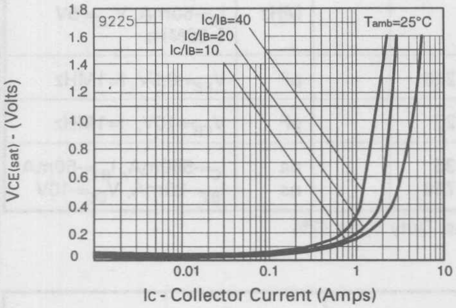


Derating curve

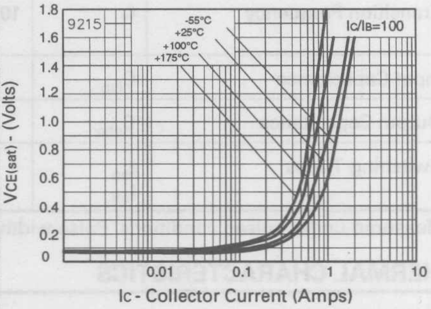


Maximum transient thermal impedance

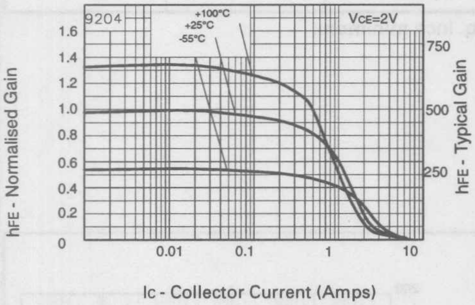
TYPICAL CHARACTERISTICS



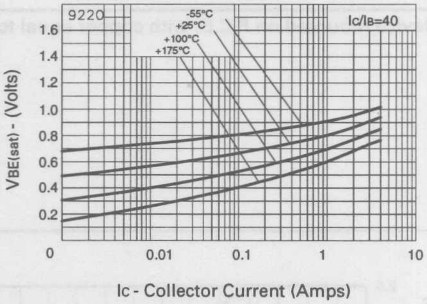
$V_{CE(sat)}$ v I_C



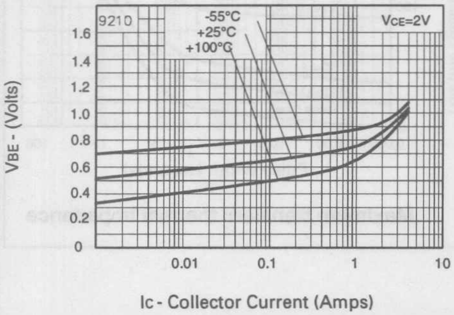
$V_{CE(sat)}$ v I_C



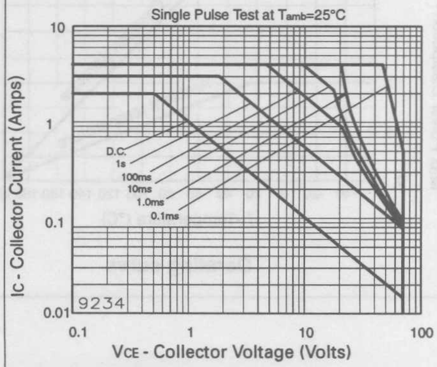
h_{FE} v I_C



$V_{BE(sat)}$ v I_C



$V_{BE(on)}$ v I_C



Safe Operating Area

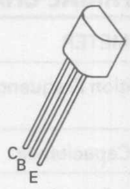
PNP SILICON PLANAR MEDIUM POWER HIGH GAIN TRANSISTOR

ZTX795A

ISSUE 1 – APRIL 94

FEATURES

- 140 Volt V_{CEO}
- Gain of 250 at I_C=0.2 Amps
- Very low saturation voltage



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	-140	V
Collector-Emitter Voltage	V_{CEO}	-140	V
Emitter-Base Voltage	V_{EBO}	-5	V
Peak Pulse Current	I_{CM}	-1	A
Continuous Collector Current	I_C	-0.5	A
Practical Power Dissipation*	P_{totp}	1.5	W
Power Dissipation at T_{amb}=25°C derate above 25°C	P_{tot}	1 5.7	W mW/°C
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +200	°C

*The power which can be dissipated assuming the device is mounted in a typical manner on a P.C.B. with copper equal to 1 inch square minimum

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C)

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	-140			V	I_C=-100μA
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	-140			V	I_C=-10mA*
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	-5			V	I_E=-100μA
Collector Cut-Off Current	I_{CBO}			-0.1	μA	V_{CB}=-100V
Emitter Cut-Off Current	I_{EBO}			-0.1	μA	V_{EB}=-4V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$			-0.3 -0.3 -0.25	V V V	I_C=-100mA, I_B=-1mA* I_C=-200mA, I_B=-5mA* I_C=-500mA, I_B=-50mA*
Base-Emitter Saturation Voltage	$V_{BE(sat)}$			-0.95	V	I_C=-500mA, I_B=-50mA*
Base-Emitter Turn-On Voltage	$V_{BE(on)}$		-0.75		V	I_C=-500mA, V_{CE}=-2V*
Static Forward Current Transfer Ratio	h_{FE}	300 250 100		800		I_C=-10mA, V_{CE}=-2V* I_C=-200mA, V_{CE}=-2V* I_C=-300mA, V_{CE}=-2V*

ZTX795A

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C)

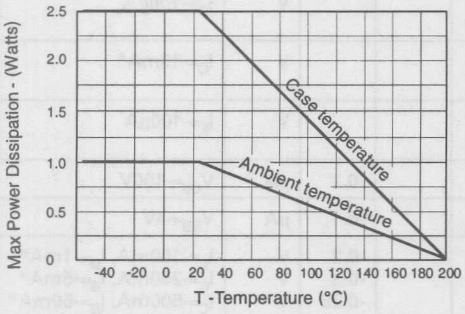
PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Transition Frequency	f_T	100			MHz	I_C=-50mA, V_{CE}=-5V f=50MHz
Input Capacitance	C_{ibo}		225		pF	V_{EB}=-0.5V, f=1MHz
Output Capacitance	C_{obo}		15		pF	V_{CB}=-10V, f=1MHz
Switching Times	t_{on} t_{off}		100 1900		ns ns	I_C=-100mA, I_{B1}=-10mA I_{B2}=-10mA, V_{CC}=-50V

*Measured under pulsed conditions. Pulse width=300µs. Duty cycle ≤2%

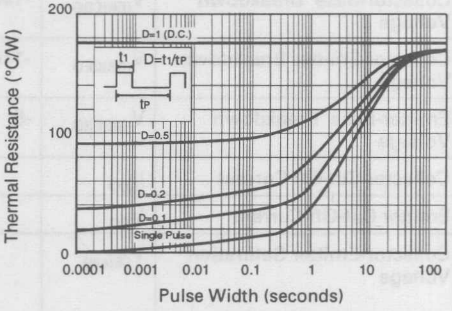
THERMAL CHARACTERISTICS

PARAMETER		SYMBOL	MAX.	UNIT
Thermal Resistance	Junction to Ambient$_1$	$R_{th(j-amb)1}$	175	°C/W
	Junction to Ambient$_2$	$R_{th(j-amb)2}$†	116	°C/W
	Junction to Case	$R_{th(j-case)}$	70	°C/W

† Device mounted on P.C.B. with copper equal to 1 sq. Inch minimum.



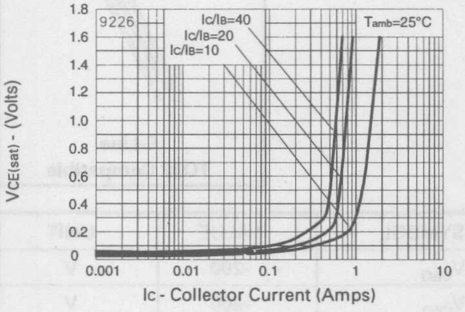
Derating curve



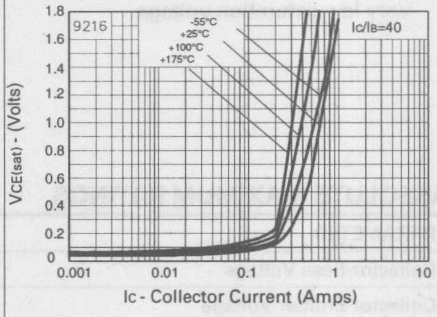
Maximum transient thermal impedance

ZTX795A

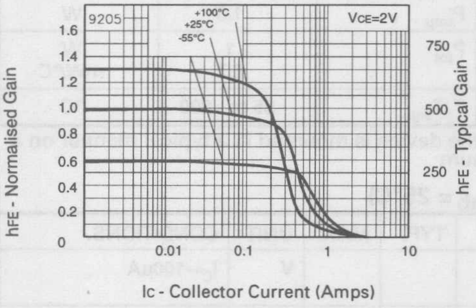
TYPICAL CHARACTERISTICS



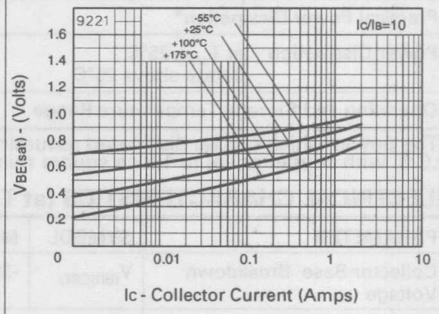
$V_{CE(sat)}$ v I_C



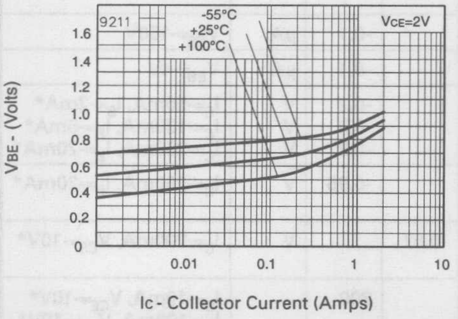
$V_{CE(sat)}$ v I_C



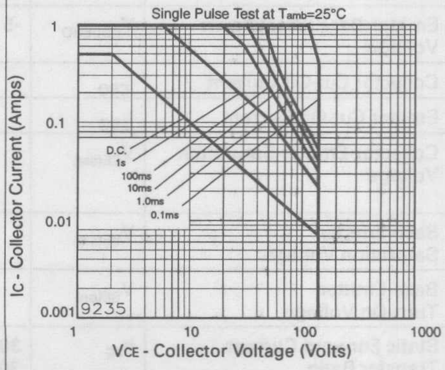
h_{FE} v I_C



$V_{BE(sat)}$ v I_C



$V_{BE(on)}$ v I_C



Safe Operating Area

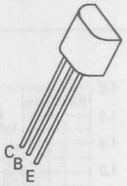
PNP SILICON PLANAR MEDIUM POWER HIGH GAIN TRANSISTOR

ZTX796A

ISSUE 1 – APRIL 94

FEATURES

- 200 Volt V_{CEO}
- Gain of 250 at I_C=0.3 Amps
- Very low saturation voltage



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	-200	V
Collector-Emitter Voltage	V_{CEO}	-200	V
Emitter-Base Voltage	V_{EBO}	-5	V
Peak Pulse Current	I_{CM}	-1	A
Continuous Collector Current	I_C	-0.5	A
Practical Power Dissipation*	P_{totp}	1.5	W
Power Dissipation at T_{amb}=25°C derate above 25°C	P_{tot}	1 5.7	W mW/°C
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +200	°C

*The power which can be dissipated assuming the device is mounted in a typical manner on a P.C.B. with copper equal to 1 inch square minimum

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C)

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	-200			V	I_C=-100μA
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	-200			V	I_C=-10mA*
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	-5			V	I_E=-100μA
Collector Cut-Off Current	I_{CBO}			-0.1	μA	V_{CB}=-150V
Emitter Cut-Off Current	I_{EBO}			-0.1	μA	V_{EB}=-4V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$			-0.2 -0.3 -0.3	V V V	I_C=-50mA, I_B=-2mA* I_C=-100mA, I_B=-5mA* I_C=-200mA, I_B=-20mA*
Base-Emitter Saturation Voltage	$V_{BE(sat)}$			-0.95	V	I_C=-200mA, I_B=-20mA*
Base-Emitter Turn-On Voltage	$V_{BE(on)}$		-0.67		V	I_C=-200mA, V_{CE}=-10V*
Static Forward Current Transfer Ratio	h_{FE}	300 300 250 100		800		I_C=-10mA, V_{CE}=-10V* I_C=-100mA, V_{CE}=-10V* I_C=-300mA, V_{CE}=-10V* I_C=-400mA, V_{CE}=-10V*

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C)

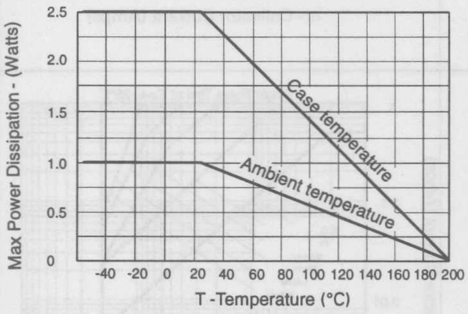
PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Transition Frequency	f_T	100			MHz	I_C=-50mA, V_{CE}=-5V f=50MHz
Input Capacitance	C_{ibo}		225		pF	V_{EB}=-0.5V, f=1MHz
Output Capacitance	C_{obo}		12		pF	V_{CB}=-10V, f=1MHz
Switching Times	t_{on} t_{off}		100 3200		ns ns	I_C=-100mA, I_{B1}=-10mA I_{B2}=-10mA, V_{CC}=-50V

*Measured under pulsed conditions. Pulse width=300µs. Duty cycle ≤2%

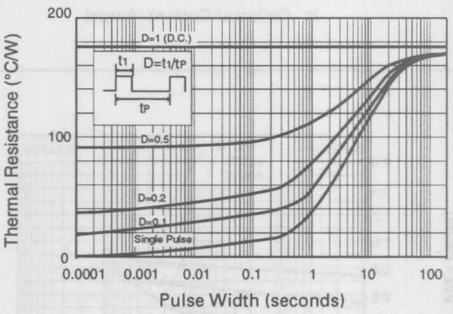
THERMAL CHARACTERISTICS

PARAMETER	SYMBOL	MAX.	UNIT
Thermal Resistance: Junction to Ambient$_1$	$R_{th(j-amb)1}$	175	°C/W
Junction to Ambient$_2$	$R_{th(j-amb)2}$†	116	°C/W
Junction to Case	$R_{th(j-case)}$	70	°C/W

† Device mounted on P.C.B. with copper equal to 1 sq. Inch minimum.

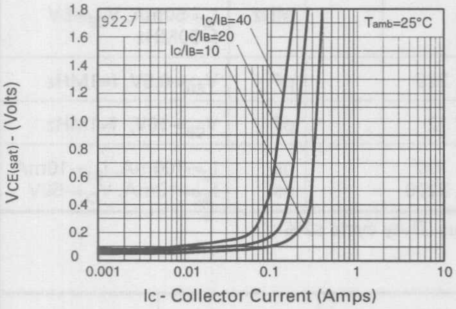


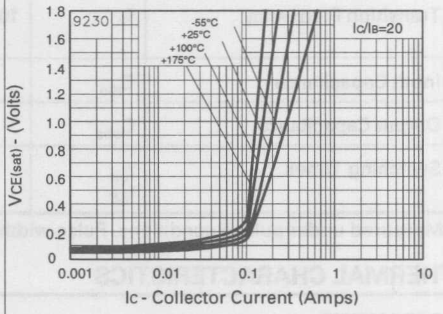
Derating curve

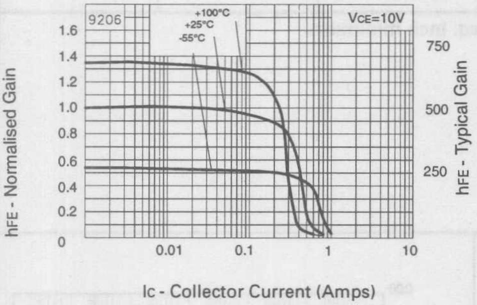


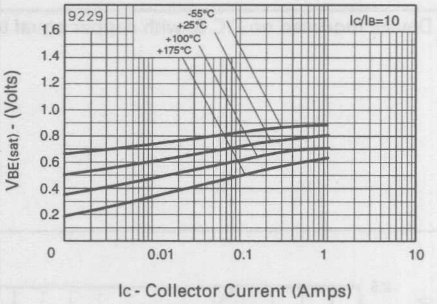
Maximum transient thermal impedance

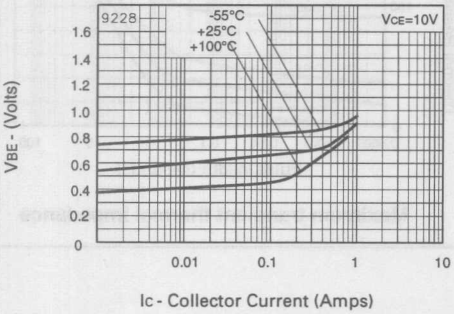
ZTX796A

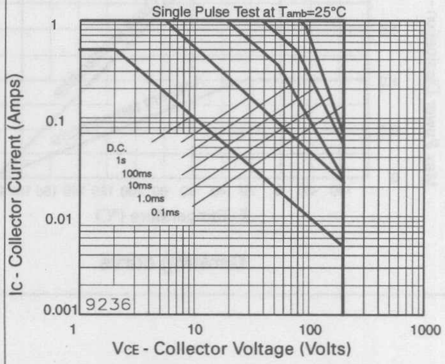

9227
Ic/IB=40
Ic/IB=20
Ic/IB=10
Tamb=25°C
VCE(sat) - (Volts)
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0
0.001
0.01
0.1
1
10
Ic - Collector Current (Amps)


9230
-55°C
+25°C
+100°C
+175°C
Ic/IB=20
VCE(sat) - (Volts)
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0
0.001
0.01
0.1
1
10
Ic - Collector Current (Amps)


9206
+100°C
+25°C
-55°C
VCE=10V
hFE - Normalised Gain
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0
750
500
250
hFE - Typical Gain
0.01
0.1
1
10
Ic - Collector Current (Amps)


9229
-55°C
+25°C
+100°C
+175°C
Ic/IB=10
VBE(sat) - (Volts)
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0
0.01
0.1
1
10
Ic - Collector Current (Amps)


9228
-55°C
+25°C
+100°C
VCE=10V
VBE - (Volts)
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0
0.01
0.1
1
10
Ic - Collector Current (Amps)


Single Pulse Test at Tamb=25°C
D.C.
1s
100ms
10ms
1.0ms
0.1ms
9236
Ic - Collector Current (Amps)
1
0.1
0.01
0.001
1
10
100
1000
VCE - Collector Voltage (Volts)

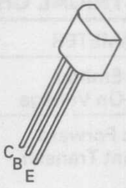
NPN SILICON PLANAR MEDIUM POWER HIGH CURRENT TRANSISTOR

ZTX849

ISSUE 2 – MARCH 94

FEATURES
- 5 Amps continuous current
- Up to 20 Amps peak current
- Very low saturation voltages

APPLICATIONS
- LCD backlight converter
- Flash gun converters
- Battery powered circuits
- Motor drivers



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	80	V
Collector-Emitter Voltage	V_{CEO}	30	V
Emitter-Base Voltage	V_{EBO}	6	V
Peak Pulse Current	I_{CM}	20	A
Continuous Collector Current	I_C	5	A
Practical Power Dissipation*	P_{totp}	1.58	W
Power Dissipation at T_{amb}=25°C	P_{tot}	1.2	W
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +200	°C

*The power which can be dissipated assuming the device is mounted in a typical manner on a P.C.B. with copper equal to 1 inch square minimum

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated)

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	80	120		V	I_C=100μA
Collector-Emitter Breakdown Voltag	$V_{(BR)CER}$	80	120		V	I_C=1μA, RB ≤1KΩ
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	30	40		V	I_C=10mA*
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	6	8		V	I_E=100μA
Collector Cut-Off Current	I_{CBO}			50 1	nA μA	V_{CB}=70V V_{CB}=70V, T_{amb}=100°C
Collector Cut-Off Current	I_{CER} R ≤1KΩ			50 1	nA μA	V_{CB}=70V V_{CB}=70V, T_{amb}=100°C
Emitter Cut-Off Current	I_{EBO}			10	nA	V_{EB}=6V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$		25 50 110 180	50 100 200 220	mV mV mV mV	I_C=0.5A, I_B=20mA* I_C=1A, I_B=20mA* I_C=2A, I_B=20mA* I_C=5A, I_B=200mA*
Base-Emitter Saturation Voltage	$V_{BE(sat)}$		930	1050	mV	I_C=5A, I_B=200mA*

ZTX849

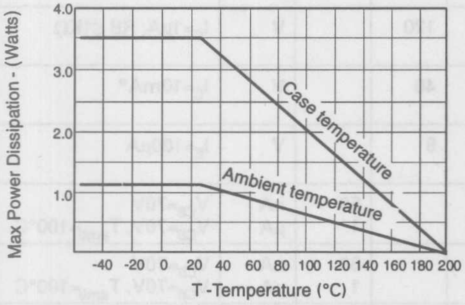
ELECTRICAL CHARACTERISTICS (at $T_{amb} = 25°C$)

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Base-Emitter Turn-On Voltage	$V_{BE(on)}$		850	950	mV	IC=5A, V_{CE}=1V*
Static Forward Current Transfer Ratio	h_{FE}	100 100 100 30	200 200 170 65	 300		I_C=10mA, V_{CE}=1V I_C=1A, V_{CE}=1V* I_C=5A, V_{CE}=1V* I_C=20A, V_{CE}=1V*
Transition Frequency	f_T		100		MHz	I_C=100mA, V_{CE}=10V f=50MHz
Output Capacitance	C_{obo}		75		pF	V_{CB}=10V, f=1MHz*
Switching Times	t_{on} t_{off}		45 630		ns ns	I_C=1A, I_{BI}=100mA I_{B2}=100mA, V_{CC}=10V

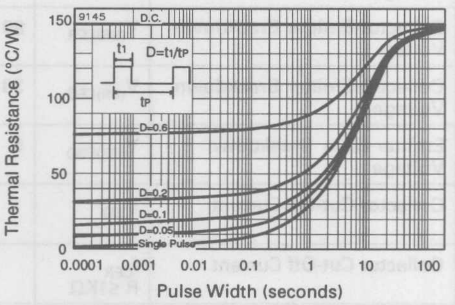
*Measured under pulsed conditions. Pulse width=300μs. Duty cycle ≤2%

THERMAL CHARACTERISTICS

PARAMETER	SYMBOL	MAX.	UNIT
Thermal Resistance: Junction to Ambient Junction to Case	$R_{th(j-amb)}$ $R_{th(j-case)}$	150 50	°C/W °C/W



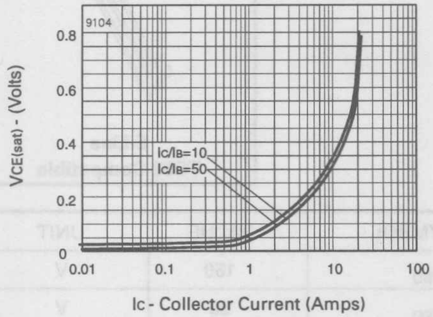
Derating curve



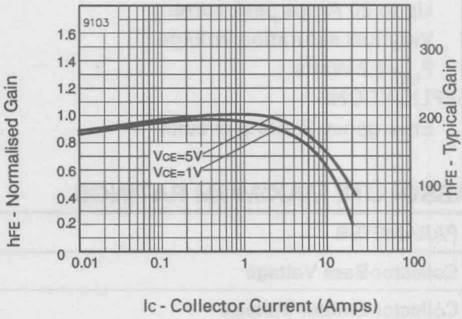
Maximum transient thermal impedance

ZTX849

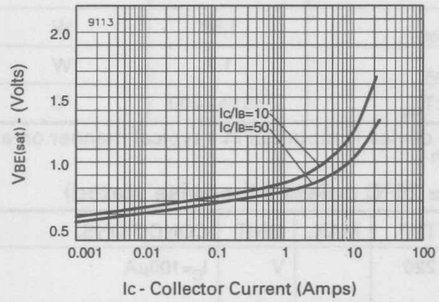
TYPICAL CHARACTERISTICS



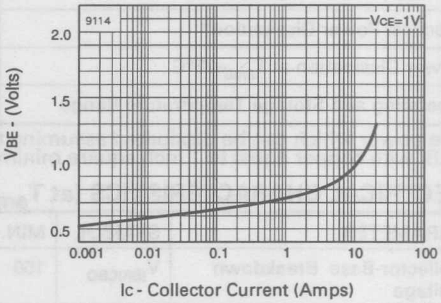
VCE(sat) v IC



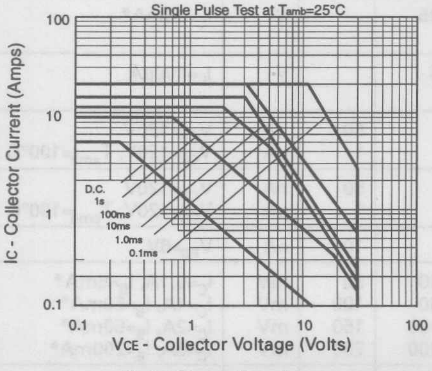
hFE v IC



VBE(sat) v IC



VBE(on) v IC



Safe Operating Area

NPN SILICON PLANAR MEDIUM POWER HIGH CURRENT TRANSISTOR

ZTX851

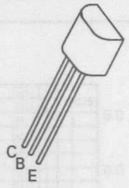
ISSUE 2 – AUGUST 94

FEATURES

- 60 Volt V_{CEO}
- 5 Amps continuous current
- Up to 20 Amps peak current
- Very low saturation voltage
- P_{tot}=1.2 Watts

APPLICATIONS

- Emergency lighting circuits



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	150	V
Collector-Emitter Voltage	V_{CEO}	60	V
Emitter-Base Voltage	V_{EBO}	6	V
Peak Pulse Current	I_{CM}	20	A
Continuous Collector Current	I_C	5	A
Practical Power Dissipation*	P_{totp}	1.58	W
Power Dissipation at T_{amb}=25°C	P_{tot}	1.2	W
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +200	°C

*The power which can be dissipated assuming the device is mounted in a typical manner on a P.C.B. with copper equal to 1 inch square minimum

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated)

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	150	220		V	I_C=100μA
Collector-Emitter Breakdown Voltag	$V_{(BR)CER}$	150	220		V	I_C=1μA, RB ≤1KΩ
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	60	85		V	I_C=10mA*
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	6	8		V	I_E=100μA
Collector Cut-Off Current	I_{CBO}			50 1	nA μA	V_{CB}=120V V_{CB}=120V, T_{amb}=100°C
Collector Cut-Off Current	I_{CER} R ≤1KΩ			50 1	nA μA	V_{CB}=120V V_{CB}=120V, T_{amb}=100°C
Emitter Cut-Off Current	I_{EBO}			10	nA	V_{EB}=6V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$		10 50 100 200	50 100 150 250	mV mV mV mV	I_C=0.1A, I_B=5mA* I_C=1A, I_B=50mA* I_C=2A, I_B=50mA* I_C=5A, I_B=200mA*
Base-Emitter Saturation Voltage	$V_{BE(sat)}$		920	1050	mV	I_C=4A, I_B=200mA*

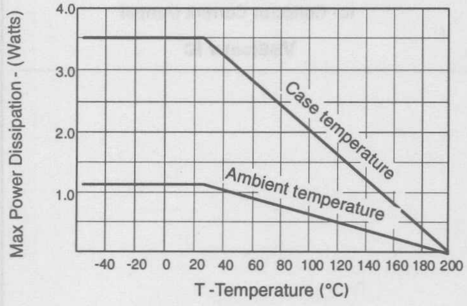
ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C)

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Base-Emitter Turn-On Voltage	$V_{BE(on)}$		840	950	mV	IC=4A, V_{CE}=1V*
Static Forward Current Transfer Ratio	h_{FE}	100 100 75 25	200 200 120 50	 300		I_C=10mA, V_{CE}=1V I_C=2A, V_{CE}=1V* I_C=5A, V_{CE}=1V* I_C=10A, V_{CE}=1V*
Transition Frequency	f_T		130		MHz	I_C=100mA, V_{CE}=10V f=50MHz
Output Capacitance	C_{obo}		45		pF	V_{CB}=10V, f=1MHz
Switching Times	t_{on} t_{off}		45 1100		ns ns	I_C=1A, I_{B1}=100mA I_{B2}=100mA, V_{CC}=10V

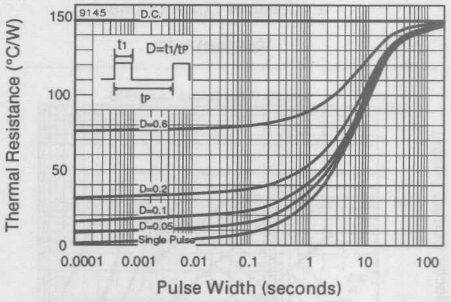
*Measured under pulsed conditions. Pulse width=300µs. Duty cycle ≤2%

THERMAL CHARACTERISTICS

PARAMETER	SYMBOL	MAX.	UNIT
Thermal Resistance: Junction to Ambient	$R_{th(j-amb)}$	150	°C/W
Junction to Case	$R_{th(j-case)}$	50	°C/W

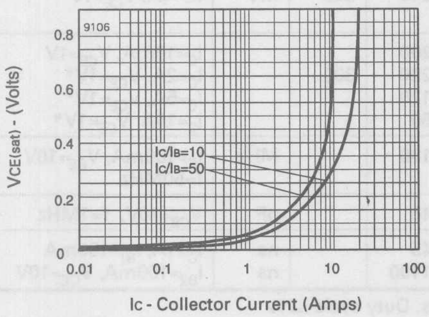


Derating curve

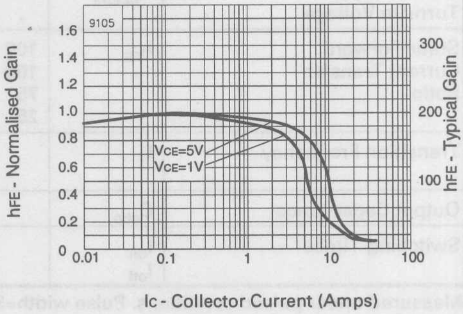


Maximum transient thermal impedance

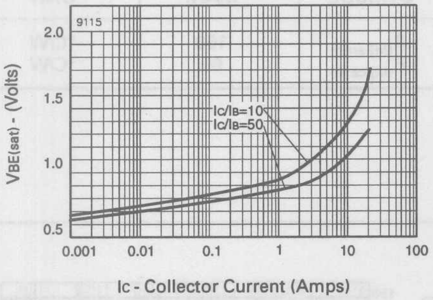
TYPICAL CHARACTERISTICS



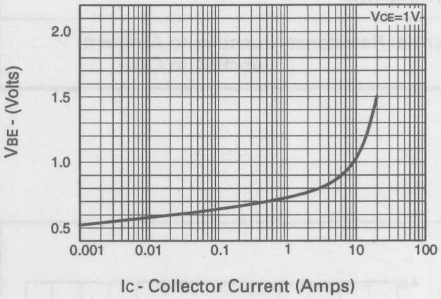
VCE(sat) v IC



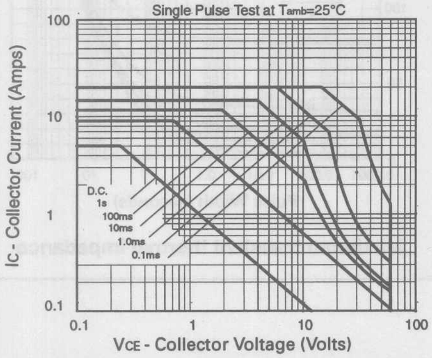
hFE v IC



VBE(sat) v IC



VBE(on) v IC



Safe Operating Area

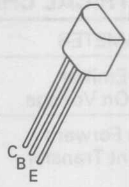
NPN SILICON PLANAR MEDIUM POWER HIGH CURRENT TRANSISTOR

ZTX853

ISSUE 3 - NOVEMBER 1995

FEATURES

- 100 Volt V_{CEO}
- 4 Amps continuous current
- Up to 10 Amps peak current
- Very low saturation voltage
- P_{tot}=1.2 Watts



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	200	V
Collector-Emitter Voltage	V_{CEO}	100	V
Emitter-Base Voltage	V_{EBO}	6	V
Peak Pulse Current	I_{CM}	10	A
Continuous Collector Current	I_C	4	A
Practical Power Dissipation*	P_{totp}	1.58	W
Power Dissipation at T_{amb}=25°C	P_{tot}	1.2	W
Operating and Storage Temperature Range	T_j:Tstg	-55 to +200	°C

*The power which can be dissipated assuming the device is mounted in a typical manner on a P.C.B. with copper equal to 1 inch square minimum

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated)

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	200	300		V	I_C=100µA
Collector-Emitter Breakdown Voltag	$V_{(BR)CER}$	200	300		V	IC=1µA, RB ≤1KΩ
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	100	120		V	I_C=10mA*
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	6	8		V	I_E=100µA
Collector Cut-Off Current	I_{CBO}			50 1	nA µA	V_{CB}=150V V_{CB}=150V, T_{amb}=100°C
Collector Cut-Off Current	I_{CER} R ≤1KΩ			50 1	nA µA	V_{CB}=150V V_{CB}=150V, T_{amb}=100°C
Emitter Cut-Off Current	I_{EBO}			10	nA	V_{EB}=6V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$		14 100 160	50 150 200	mV mV mV	I_C=0.1A, I_B=5mA I_C=2A, I_B=100mA I_C=4A, I_B=400mA*
Base-Emitter Saturation Voltage	$V_{BE(sat)}$		960	1100	mV	I_C=4A, I_B=400mA*

ZTX853

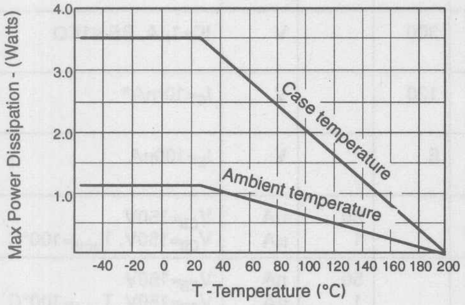
ELECTRICAL CHARACTERISTICS (at $T_{amb} = 25°C$)

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Base-Emitter Turn-On Voltage	$V_{BE(on)}$		830	950	V	I_C=4A, V_{CE}=2V*
Static Forward Current Transfer Ratio	h_{FE}	100 100 50 20	200 200 100 30	 300		I_C=10mA, V_{CE}=2V I_C=2A, V_{CE}=2V* I_C=4A, V_{CE}=2V* I_C=10A, V_{CE}=2V*
Transition Frequency	f_T		130		MHz	I_C=100mA, V_{CE}=10V f=50MHz
Output Capacitance	C_{obo}		35		pF	V_{CB}=10V, f=1MHz
Switching Times	t_{on} t_{off}		50 1650		ns ns	I_C=1A, I_{B1}=100mA I_{B2}=100mA, V_{CC}=10V

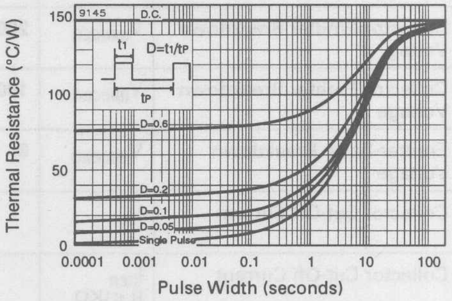
*Measured under pulsed conditions. Pulse width=300µs. Duty cycle ≤2%

THERMAL CHARACTERISTICS

PARAMETER	SYMBOL	MAX.	UNIT
Thermal Resistance: Junction to Ambient Junction to Case	$R_{th(j\text{-}amb)}$ $R_{th(j\text{-}case)}$	150 50	°C/W °C/W

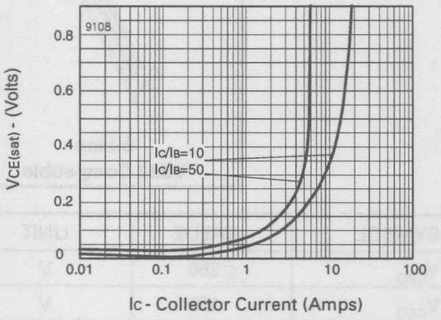


Derating curve

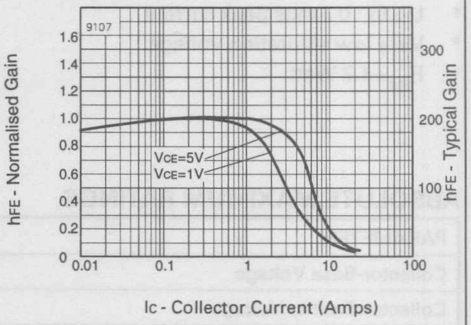


Maximum transient thermal impedance

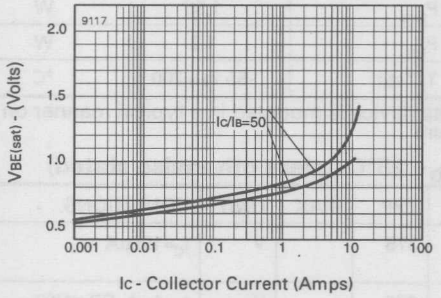
TYPICAL CHARACTERISTICS



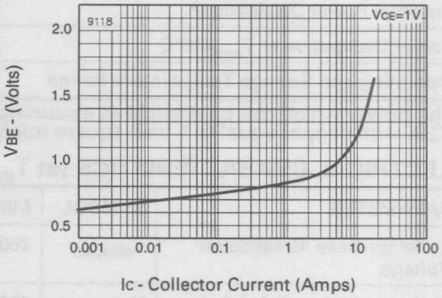
VCE(sat) v IC



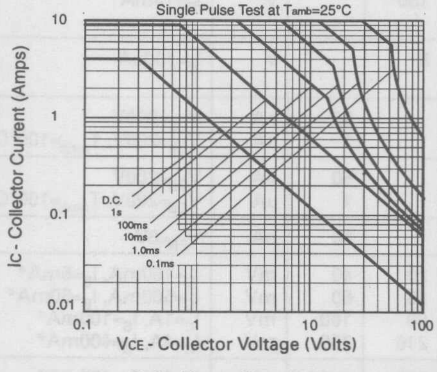
hFE v IC



VBE(sat) v IC



VBE(on) v IC



Safe Operating Area

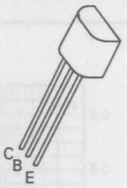
NPN SILICON PLANAR MEDIUM POWER HIGH CURRENT TRANSISTOR

ZTX855

ISSUE 2 – MARCH 94

FEATURES

- 150 Volt V_{CEO}
- 4 Amps continuous current
- Up to 10 Amps peak current
- Very low saturation voltage
- P_{tot}= 1.2 Watt



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	250	V
Collector-Emitter Voltage	V_{CEO}	150	V
Emitter-Base Voltage	V_{EBO}	6	V
Peak Pulse Current	I_{CM}	10	A
Continuous Collector Current	I_C	4	A
Practical Power Dissipation*	P_{totp}	1.58	W
Power Dissipation at T_{amb}=25°C	P_{tot}	1.2	W
Operating and Storage Temperature Range	T_j:Tstg	-55 to +200	°C

*The power which can be dissipated assuming the device is mounted in a typical manner on a P.C.B. with copper equal to 1 inch square minimum

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated)

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	250	375		V	I_C=100μA
Collector-Emitter Breakdown Voltag	$V_{(BR)CER}$	250	375		V	I_C=1μA, RB ≤1KΩ
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	150	180		V	I_C=10mA*
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	6	8		V	I_E=100μA
Collector Cut-Off Current	I_{CBO}			50 1	nA μA	V_{CB}=200V V_{CB}=200V, T_{amb}=100°C
Collector Cut-Off Current	I_{CER} R ≤1KΩ			50 1	nA μA	V_{CB}=200V V_{CB}=200V, T_{amb}=100°C
Emitter Cut-Off Current	I_{EBO}			10	nA	V_{EB}=6V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$		20 35 60 210	40 60 100 260	mV mV mV mV	I_C=100mA, I_B=5mA* I_C=500mA, I_B=50mA* I_C=1A, I_B=100mA* I_C=4A, I_B=400mA*
Base-Emitter Saturation Voltage	$V_{BE(sat)}$		960	1100	mV	I_C=4A, I_B=400mA*

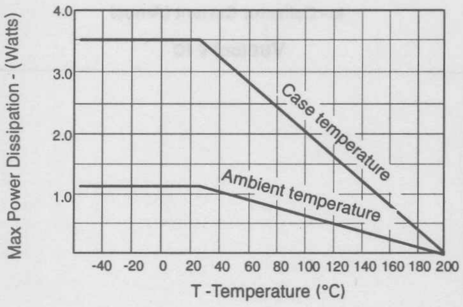
ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C)

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Base-Emitter Turn-On Voltage	$V_{BE(on)}$		0.88	1	V	I_C=4A, V_{CE}=5V*
Static Forward Current Transfer Ratio	h_{FE}	100 100 35	200 200 55 10	 300		I_C=10mA, V_{CE}=5V I_C=1A, V_{CE}=5V* I_C=4A, V_{CE}=5V* I_C=10A, V_{CE}=5V*
Transition Frequency	f_T		90		MHz	I_C=100mA, V_{CE}=10V f=50MHz
Output Capacitance	C_{obo}		22		pF	V_{CB}=20V, f=1MHz
Switching Times	t_{on} t_{off}		66 2130		ns ns	I_C=1A, I_{B1}=100mA I_{B2}=100mA, V_{CC}=50V

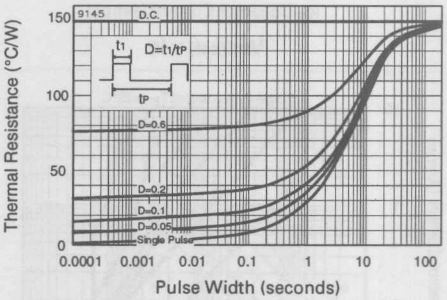
*Measured under pulsed conditions. Pulse width=300µs. Duty cycle ≤2%

THERMAL CHARACTERISTICS

PARAMETER	SYMBOL	MAX.	UNIT
Thermal Resistance: Junction to Ambient	$R_{th(j-amb)}$	150	°C/W
Junction to Case	$R_{th(j-case)}$	50	°C/W

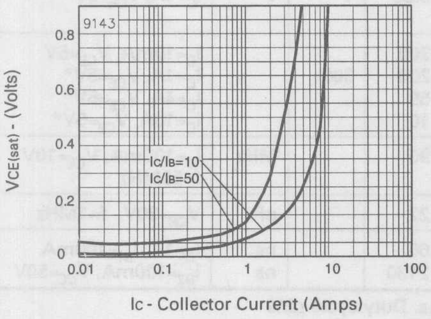


Derating curve

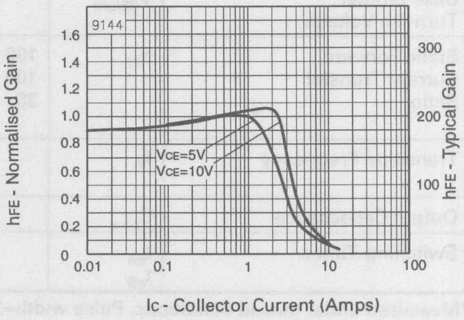


Maximum transient thermal impedance

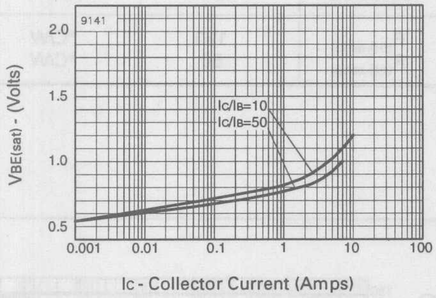
TYPICAL CHARACTERISTICS



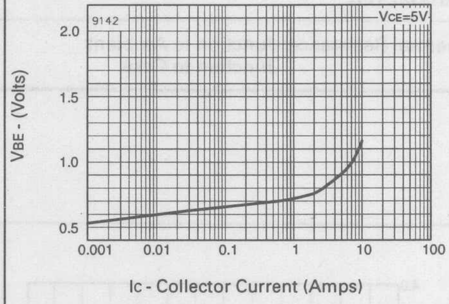
$V_{CE(sat)}$ v I_C



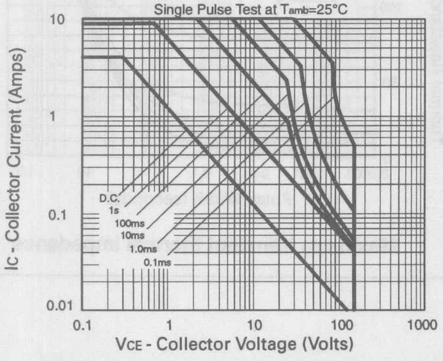
h_{FE} v I_C



$V_{BE(sat)}$ v I_C



$V_{BE(on)}$ v I_C



Safe Operating Area

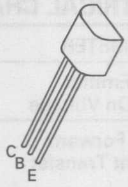
NPN SILICON PLANAR MEDIUM POWER HIGH CURRENT TRANSISTOR

ZTX857

ISSUE 1 – APRIL 94

FEATURES

- 300 Volt V_{CEO}
- 3 Amps continuous current
- Up to 5 Amps peak current
- Very low saturation voltage
- P_{tot}= 1.2 Watt



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	330	V
Collector-Emitter Voltage	V_{CEO}	300	V
Emitter-Base Voltage	V_{EBO}	6	V
Peak Pulse Current	I_{CM}	5	A
Continuous Collector Current	I_C	3	A
Practical Power Dissipation*	P_{totp}	1.58	W
Power Dissipation at T_{amb}=25°C	P_{tot}	1.2	W
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +200	°C

*The power which can be dissipated assuming the device is mounted in a typical manner on a P.C.B. with copper equal to 1 inch square minimum

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated)

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	330	475		V	I_C=100μA
Collector-Emitter Breakdown Voltag	$V_{(BR)CER}$	330	475		V	I_C=1μA, RB ≤1KΩ
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	300	350		V	I_C=10mA*
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	6	8		V	I_E=100μA
Collector Cut-Off Current	I_{CBO}			50 1	nA μA	V_{CB}=300V V_{CB}=300V, T_{amb}=100°C
Collector Cut-Off Current	I_{CER} R ≤1KΩ			50 1	nA μA	V_{CB}=300V V_{CB}=300V, T_{amb}=100°C
Emitter Cut-Off Current	I_{EBO}			10	nA	V_{EB}=6V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$		50 80 140 170	100 140 200 250	mV mV mV mV	I_C=0.5A, I_B=50mA* I_C=1A, I_B=100mA* I_C=2A, I_B=200mA* I_C=3A, I_B=600mA*
Base-Emitter Saturation Voltage	$V_{BE(sat)}$		870	1000	mV	I_C=2A, I_B=200mA*

ZTX857

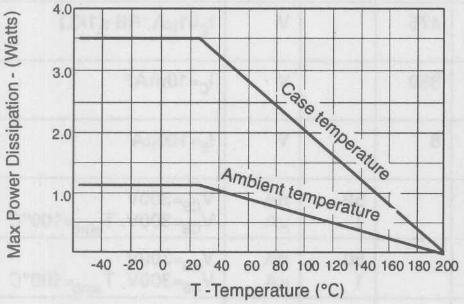
ELECTRICAL CHARACTERISTICS (at $T_{amb} = 25°C$)

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Base-Emitter Turn-On Voltage	$V_{BE(on)}$		810	950	mV	I_C=2A, V_{CE}=5V*
Static Forward Current Transfer Ratio	h_{FE}	100 100 15	200 200 25 15	 300		I_C=10mA, V_{CE}=5V I_C=500mA, V_{CE}=10V* I_C=2A, V_{CE}=10V* I_C=3A, V_{CE}=10V*
Transition Frequency	f_T		80		MHz	I_C=100mA, V_{CE}=10V f=100MHz
Output Capacitance	C_{obo}		11		pF	V_{CB}=20V, f=1MHz
Switching Times	t_{on} t_{off}		100 5300		ns ns	I_C=250mA, I_{B1}=25mA I_{B2}=25mA, V_{CC}=50V

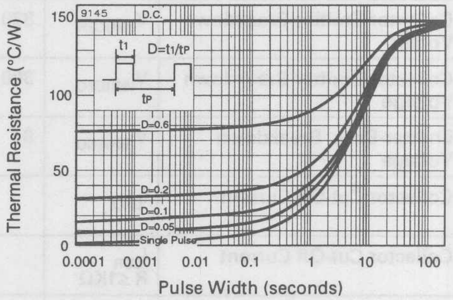
*Measured under pulsed conditions. Pulse width=300μs. Duty cycle ≤2%

THERMAL CHARACTERISTICS

PARAMETER	SYMBOL	MAX.	UNIT
Thermal Resistance: Junction to Ambient Junction to Case	$R_{th(j-amb)}$ $R_{th(j-case)}$	150 50	°C/W °C/W

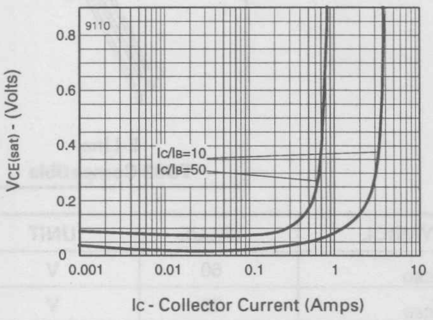


Derating curve

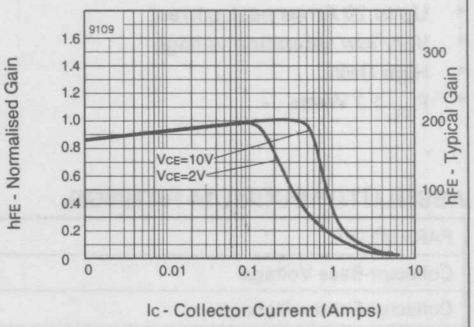


Maximum transient thermal impedance

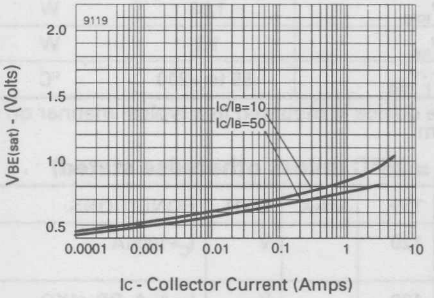
TYPICAL CHARACTERISTICS



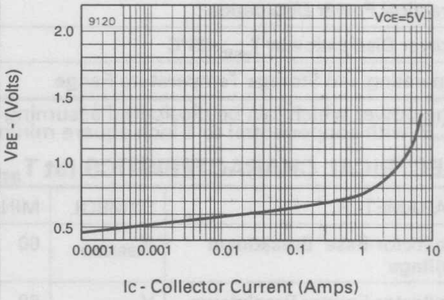
VCE(sat) v IC



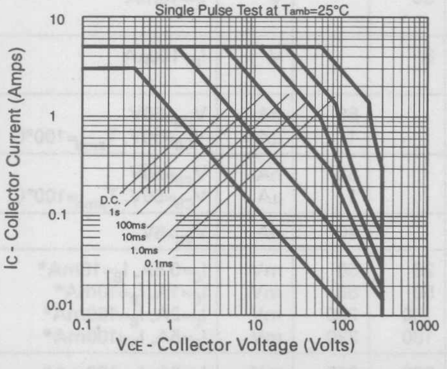
hFE v IC



VBE(sat) v IC



VBE(on) v IC



Safe Operating Area

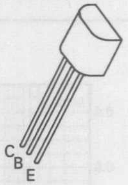
NPN SILICON PLANAR MEDIUM POWER HIGH CURRENT TRANSISTOR

ZTX869

ISSUE 1 – APRIL 94

FEATURES

- 25 Volt V_{CEO}
- 5 Amps continuous current
- Up to 20 Amps peak current
- Very low saturation voltage
- High Gain
- P_{tot}=1.2 Watts



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	60	V
Collector-Emitter Voltage	V_{CEO}	25	V
Emitter-Base Voltage	V_{EBO}	6	V
Peak Pulse Current	I_{CM}	20	A
Continuous Collector Current	I_C	5	A
Practical Power Dissipation*	P_{totp}	1.58	W
Power Dissipation at T_{amb}=25°C	P_{tot}	1.2	W
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +200	°C

*The power which can be dissipated assuming the device is mounted in a typical manner on a P.C.B. with copper equal to 1 inch square minimum

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated)

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	60	120		V	I_C=100µA
Collector-Emitter Breakdown Voltag	$V_{(BR)CER}$	60	120		V	I_C=1µA, RB ≤1KΩ
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	25	35		V	I_C=10mA*
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	6	8		V	I_E=100µA
Collector Cut-Off Current	I_{CBO}			50 1	nA µA	V_{CB}=50V V_{CB}=50V, T_{amb}=100°C
Collector Cut-Off Current	I_{CER} R ≤1KΩ			50 1	nA µA	V_{CB}=50V V_{CB}=50V, T_{amb}=100°C
Emitter Cut-Off Current	I_{EBO}			10	nA	V_{EB}=6V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$		25 50 100 180	50 80 200 220	mV mV mV mV	I_C=0.5A, I_B=10mA* I_C=1A, I_B=10mA* I_C=2A, I_B=100mA* I_C=5A, I_B=100mA*
Base-Emitter Saturation Voltage	$V_{BE(sat)}$		880	950	mV	I_C=5A, I_B=100mA*

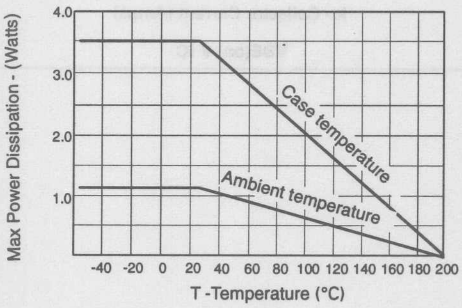
ELECTRICAL CHARACTERISTICS (at $T_{amb} = 25°C$)

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Base-Emitter Turn-On Voltage	$V_{BE(on)}$		800	900	mV	I_C=5A, V_{CE}=1V*
Static Forward Current Transfer Ratio	h_{FE}	300 300 250 40	450 450 400 100			I_C=10mA, V_{CE}=1V I_C=1A, V_{CE}=1V* I_C=5A, V_{CE}=1V* I_C=20A, V_{CE}=1V*
Transition Frequency	f_T		100		MHz	I_C=100mA, V_{CE}=10V f=50MHz
Output Capacitance	C_{obo}		70		pF	V_{CB}=10V, f=1MHz
Switching Times	t_{on} t_{off}		60 680		ns ns	I_C=1A, I_{B1}=100mA I_{B2}=100mA, V_{CC}=10V

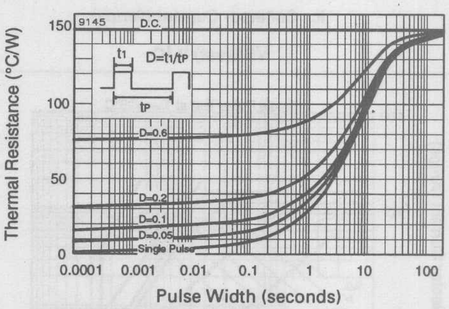
*Measured under pulsed conditions. Pulse width=300µs. Duty cycle ≤2%

THERMAL CHARACTERISTICS

PARAMETER	SYMBOL	MAX.	UNIT
Thermal Resistance: Junction to Ambient Junction to Case	$R_{th(j-amb)}$ $R_{th(j-case)}$	150 50	°C/W °C/W



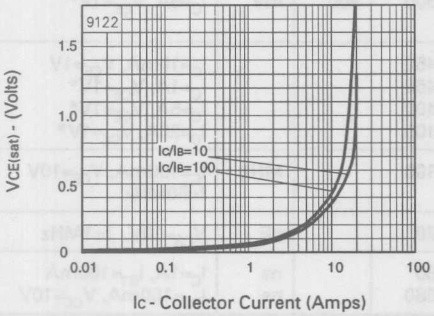
Derating curve



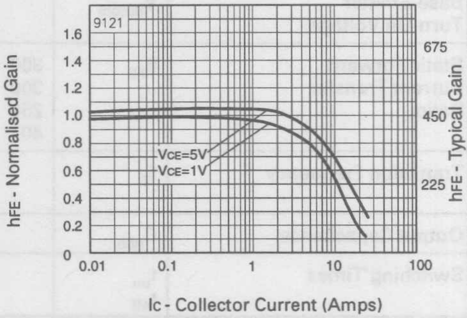
Maximum transient thermal impedance

ZTX869

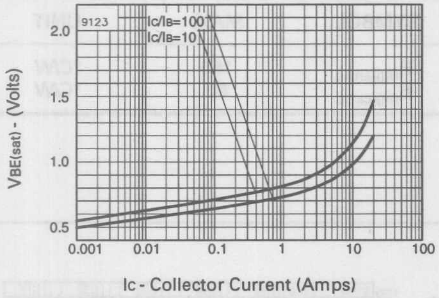
TYPICAL CHARACTERISTICS



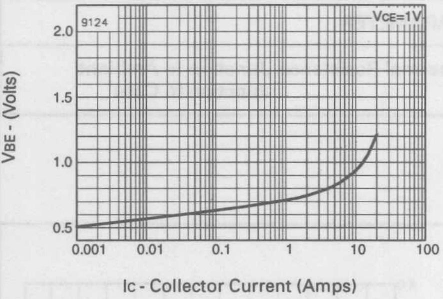
VCE(sat) v IC



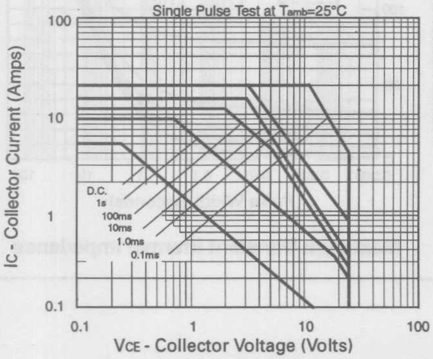
hFE v IC



VBE(sat) v IC



VBE(on) v IC



Safe Operating Area

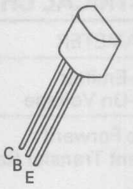
PNP SILICON PLANAR MEDIUM POWER HIGH CURRENT TRANSISTOR

ZTX948

ISSUE 2 – JUNE 94

FEATURES

- 4.5 Amps continuous current
- Up to 20 Amps peak current
- Very low saturation voltage
- Excellent gain up to 20 Amps
- Very low leakage
- Exceptional gain linearity down to 10mA
- Spice model available



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	-40	V
Collector-Emitter Voltage	V_{CEO}	-20	V
Emitter-Base Voltage	V_{EBO}	-6	V
Peak Pulse Current	I_{CM}	-20	A
Continuous Collector Current	I_C	-4.5	A
Practical Power Dissipation*	P_{totp}	1.58	W
Power Dissipation at T_{amb}=25°C	P_{tot}	1.2	W
Operating and Storage Temperature Range	T_j:Tstg	-55 to +200	°C

*The power which can be dissipated assuming the device is mounted in a typical manner on a P.C.B. with copper equal to 1 inch square minimum

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated)

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	-40	-55		V	I_C=-100µA
Collector-Emitter Breakdown Voltag	$V_{(BR)CER}$	-40	-55		V	I_C=-1µA, RB ≤1KΩ
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	-20	-30		V	I_C=-10mA*
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	-6	-8		V	I_E=-100µA
Collector Cut-Off Current	I_{CBO}			-50 -1	nA µA	V_{CB}=-30V V_{CB}=-30V, T_{amb}=100°C
Collector Cut-Off Current	I_{CER} R ≤1KΩ			-50 -1	nA µA	V_{CB}=-30V V_{CB}=-30V, T_{amb}=100°C
Emitter Cut-Off Current	I_{EBO}			-10	nA	V_{EB}=-6V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$		-45 -90 -180 -230	-100 -150 -250 -310	mV mV mV mV	I_C=-0.5A, I_B=-10mA* I_C=-2A, I_B=-200mA* I_C=-4A, I_B=-400mA* I_C=-5A, I_B=-300mA*
Base-Emitter Saturation Voltage	$V_{BE(sat)}$		-960	-1100	mV	I_C=-5A, I_B=-300mA*

ZTX948

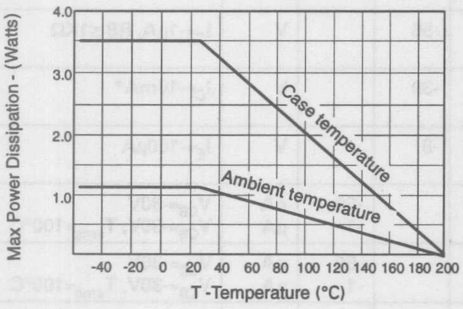
ELECTRICAL CHARACTERISTICS (at $T_{amb} = 25°C$)

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Base-Emitter Turn-On Voltage	$V_{BE(on)}$		-860	-1000	mV	I_C=-5A, V_{CE}=-1V*
Static Forward Current Transfer Ratio	h_{FE}	100 100 75 60 15	200 200 160 130 40	 300		I_C=-10mA, V_{CE}=-1V I_C=-1A, V_{CE}=-1V* I_C=-5A, V_{CE}=-1V* I_C=-10A, V_{CE}=-1V* I_C=-20A, V_{CE}=-1V*
Transition Frequency	f_T		80		MHz	I_C=-100mA, V_{CE}=-10V f=50MHz
Output Capacitance	C_{obo}		163		pF	V_{CB}=-10V, f=1MHz
Switching Times	t_{on} t_{off}		120 126		ns ns	I_C=-4A, I_{B1}=-400mA I_{B2}=400mA, V_{CC}=-10V

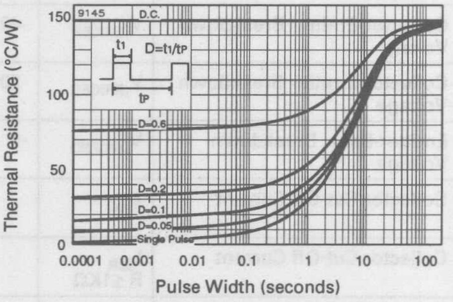
*Measured under pulsed conditions. Pulse width=300µs. Duty cycle ≤2%

THERMAL CHARACTERISTICS

PARAMETER	SYMBOL	MAX.	UNIT
Thermal Resistance: Junction to Ambient	$R_{th(j-amb)}$	150	°C/W
Junction to Case	$R_{th(j-case)}$	50	°C/W

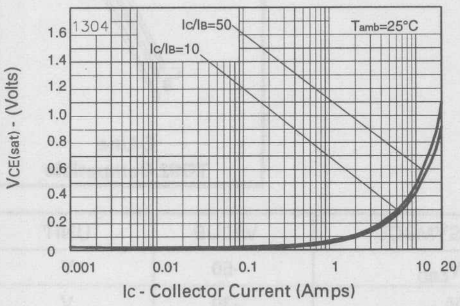


Derating curve

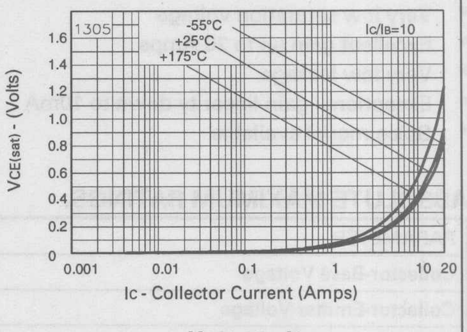


Maximum transient thermal impedance

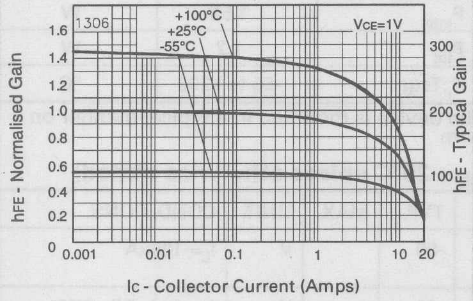
TYPICAL CHARACTERISTICS



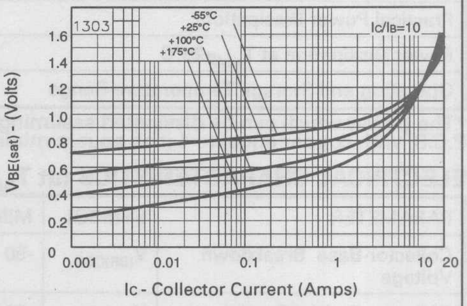
VCE(sat) v IC



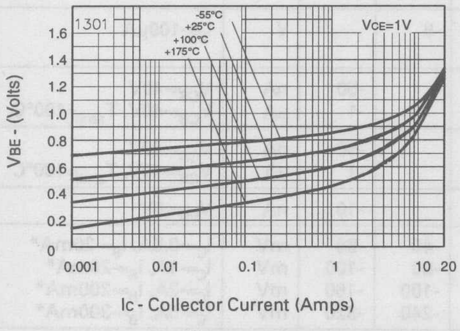
VCE(sat) v IC



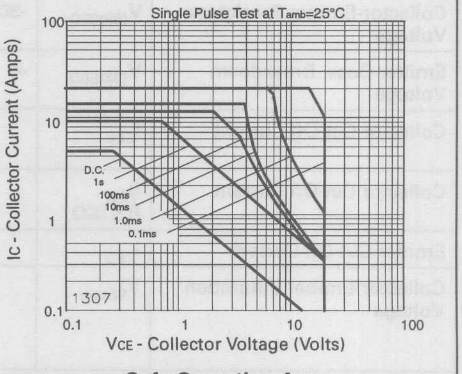
hFE v IC



VBE(sat) v IC



VBE(on) v IC



Safe Operating Area

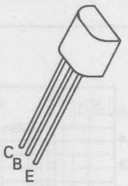
PNP SILICON PLANAR MEDIUM POWER HIGH CURRENT TRANSISTOR

ISSUE 3 – JUNE 94

ZTX949

FEATURES

- 4.5 Amps continuous current
- Up to 20 Amps peak current
- Very low saturation voltage
- Excellent gain up to 20 Amps
- Very low leakage
- Exceptional gain linearity down to 10mA
- Spice model available



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	-50	V
Collector-Emitter Voltage	V_{CEO}	-30	V
Emitter-Base Voltage	V_{EBO}	-6	V
Peak Pulse Current	I_{CM}	-20	A
Continuous Collector Current	I_C	-4.5	A
Practical Power Dissipation*	P_{totp}	1.58	W
Power Dissipation at T_{amb}=25°C	P_{tot}	1.2	W
Operating and Storage Temperature Range	T_j:Tstg	-55 to +200	°C

*The power which can be dissipated assuming the device is mounted in a typical manner on a P.C.B. with copper equal to 1 inch square minimum

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated)

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	-50	-80		V	I_C=-100μA
Collector-Emitter Breakdown Voltag	$V_{(BR)CER}$	-50	-80		V	I_C=-1μA, RB ≤1KΩ
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	-30	-45		V	I_C=-10mA*
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	-6	-8		V	I_E=-100μA
Collector Cut-Off Current	I_{CBO}			-50 -1	nA μA	V_{CB}=-40V V_{CB}=-40V, T_{amb}=100°C
Collector Cut-Off Current	I_{CER} R ≤1KΩ			-50 -1	nA μA	V_{CB}=-40V V_{CB}=-40V, T_{amb}=100°C
Emitter Cut-Off Current	I_{EBO}			-10	nA	V_{EB}=-6V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$		-40 -80 -100 -240	-60 -100 -160 -320	mV mV mV mV	I_C=-0.5A, I_B=-20mA* I_C=-1A, I_B=-20mA* I_C=-2A, I_B=-200mA* I_C=-5A, I_B=-300mA*
Base-Emitter Saturation Voltage	$V_{BE(sat)}$		-960	-1100	mV	I_C=-5A, I_B=-300mA*

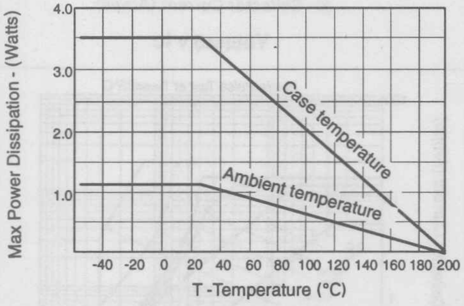
ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C)

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Base-Emitter Turn-On Voltage	$V_{BE(on)}$		-860	-1000	mV	I_C=-5A, V_{CE}=-1V*
Static Forward Current Transfer Ratio	h_{FE}	100 100 75	200 200 140 35	 300		I_C=-10mA, V_{CE}=-1V I_C=-1A, V_{CE}=-1V* I_C=-5A, V_{CE}=-1V* I_C=-20A, V_{CE}=-1V*
Transition Frequency	f_T		100		MHz	I_C=-100mA, V_{CE}=-10V f=50MHz
Output Capacitance	C_{obo}		122		pF	V_{CB}=-10V, f=1MHz
Switching Times	t_{on} t_{off}		120 130		ns ns	I_C=-4A, I_{B1}=-400mA I_{B2}=400mA, V_{CC}=-10V

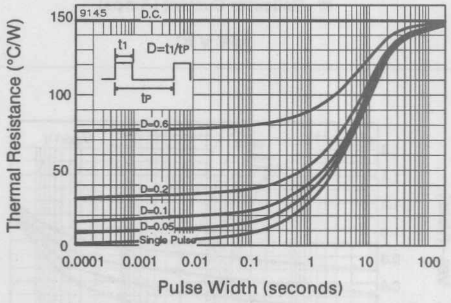
*Measured under pulsed conditions. Pulse width=300µs. Duty cycle ≤2%

THERMAL CHARACTERISTICS

PARAMETER	SYMBOL	MAX.	UNIT
Thermal Resistance: Junction to Ambient	$R_{th(j-amb)}$	150	°C/W
Junction to Case	$R_{th(j-case)}$	50	°C/W



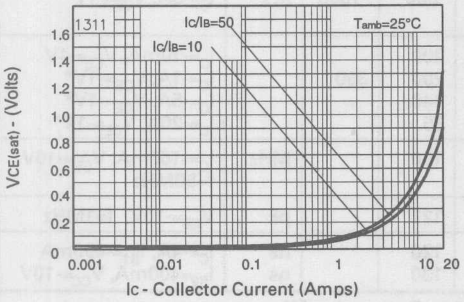
Derating curve



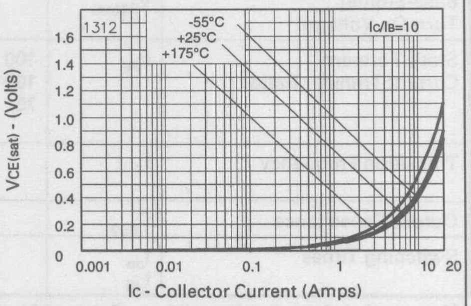
Maximum transient thermal impedance

ZTX949

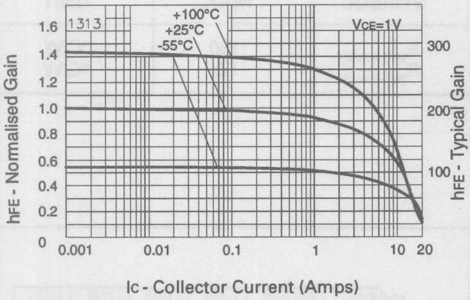
TYPICAL CHARACTERISTICS



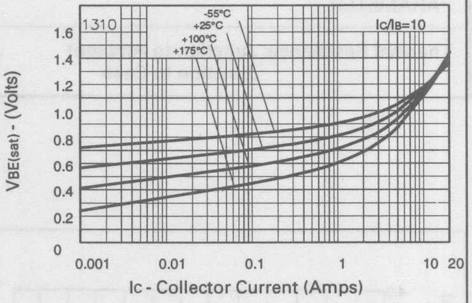
VCE(sat) v IC



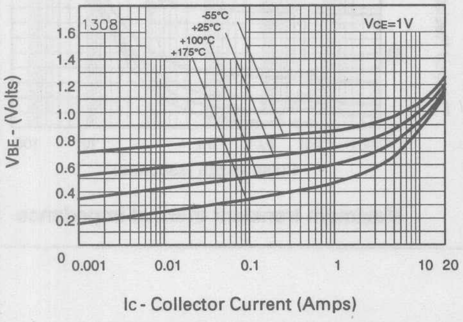
VCE(sat) v IC



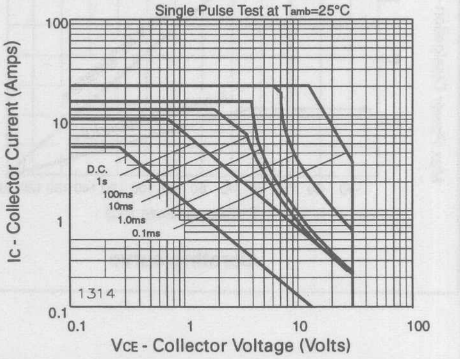
hFE v IC



VBE(sat) v IC



VBE(on) v IC



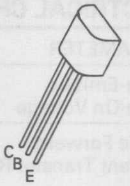
Safe Operating Area

PNP SILICON PLANAR MEDIUM POWER HIGH CURRENT TRANSISTOR

ISSUE 4 – JUNE 94

ZTX951

- 4 Amps continuous current
- Up to 15 Amps peak current
- Very low saturation voltage
- Excellent gain up to 10 Amps
- Spice model available



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	-100	V
Collector-Emitter Voltage	V_{CEO}	-60	V
Emitter-Base Voltage	V_{EBO}	-6	V
Peak Pulse Current	I_{CM}	-15	A
Continuous Collector Current	I_C	-4	A
Practical Power Dissipation*	P_{totp}	1.58	W
Power Dissipation at T_{amb}=25°C	P_{tot}	1.2	W
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +200	°C

*The power which can be dissipated assuming the device is mounted in a typical manner on a P.C.B. with copper equal to 1 inch square minimun.

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated)

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	-100	-140		V	I_C=-100µA
Collector-Emitter Breakdown Voltag	$V_{(BR)CER}$	-100	-140		V	I_C=-1µA, RB ≤1KΩ
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	-60	-90		V	I_C=-10mA*
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	-6	-8		V	I_E=-100µA
Collector Cut-Off Current	I_{CBO}			-50 -1	nA µA	V_{CB}=-80V V_{CB}=-80V, T_{amb}=100°C
Collector Cut-Off Current	I_{CER} R ≤1KΩ			-50 -1	nA µA	V_{CB}=-80V V_{CB}=-80V, T_{amb}=100°C
Emitter Cut-Off Current	I_{EBO}			-10	nA	V_{EB}=-6V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$		-15 -60 -120 -220	-50 -100 -160 -300	mV mV mV mV	I_C=-100mA, I_B=-10mA* I_C=-1A, I_B=-100mA* I_C=-2A, I_B=-200mA* I_C=-4A, I_B=-400mA*
Base-Emitter Saturation Voltage	$V_{BE(sat)}$		-960	-1100	mV	I_C=-4A, I_B=-400mA*

ZTX951

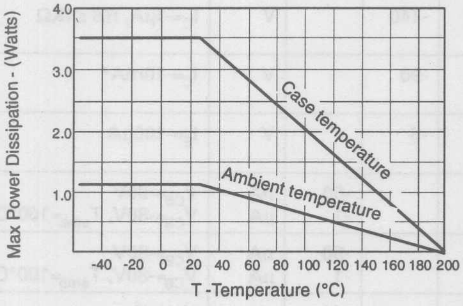
ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C)

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Base-Emitter Turn-On Voltage	$V_{BE(on)}$		-850	-1000	mV	I_C=-4A, V_{CE}=-1V*
Static Forward Current Transfer Ratio	h_{FE}	100 100 75 10	200 200 120 25	 300		I_C=-10mA, V_{CE}=-1V* I_C=-1A, V_{CE}=-1V* I_C=-4A, V_{CE}=-1V* I_C=-10A, V_{CE}=-1V*
Transition Frequency	f_T		120		MHz	I_C=-100mA, V_{CE}=-10V f=50MHz
Output Capacitance	C_{obo}		74		pF	V_{CB}=-10V, f=1MHz
Switching Times	t_{on} t_{off}		82 350		ns ns	I_C=-2A, I_{B1}=-200mA I_{B2}=200mA, V_{CC}=-10V

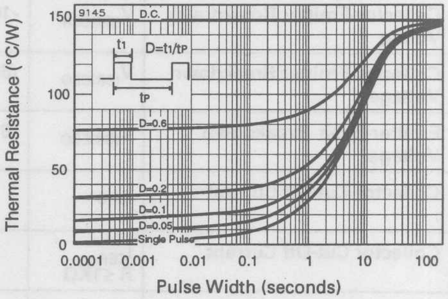
*Measured under pulsed conditions. Pulse width=300µs. Duty cycle ≤2%

THERMAL CHARACTERISTICS

PARAMETER	SYMBOL	MAX.	UNIT
Thermal Resistance: Junction to Ambient Junction to Case	$R_{th(j-amb)}$ $R_{th(j-case)}$	150 50	°C/W °C/W



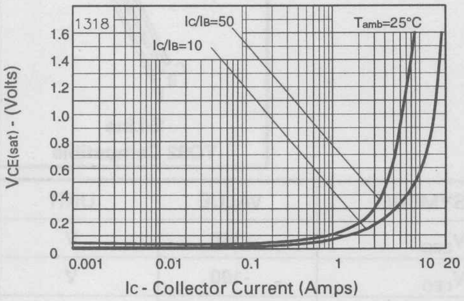
Derating curve



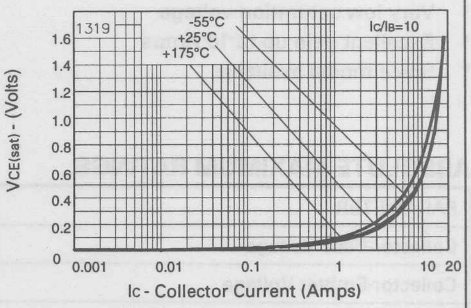
Maximum transient thermal impedance

ZTX951

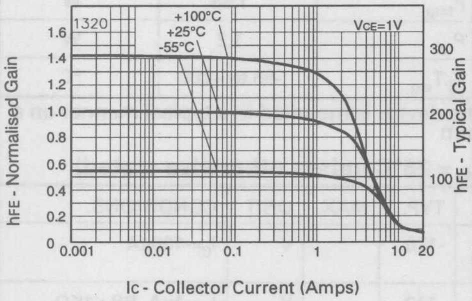
TYPICAL CHARACTERISTICS



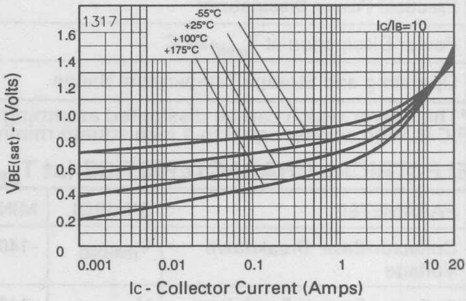
VCE(sat) v IC



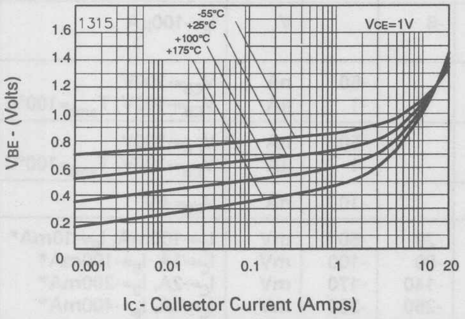
VCE(sat) v IC



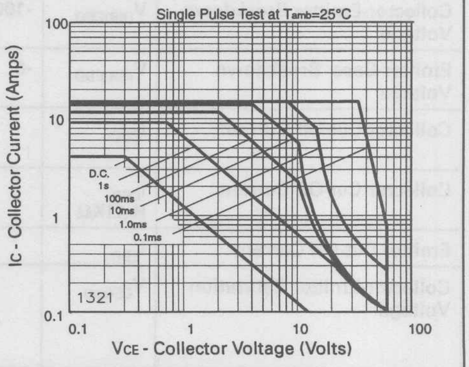
hFE v IC



VBE(sat) v IC



VBE(on) v IC



Safe Operating Area

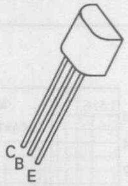
PNP SILICON PLANAR MEDIUM POWER HIGH CURRENT TRANSISTOR

ZTX953

ISSUE 4 – JUNE 94

FEATURES

- 3.5 Amps continuous current
- Up to 10 Amps peak current
- Very low saturation voltage
- Excellent gain up to 10 Amps
- Spice model available



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	-140	V
Collector-Emitter Voltage	V_{CEO}	-100	V
Emitter-Base Voltage	V_{EBO}	-6	V
Peak Pulse Current	I_{CM}	-10	A
Continuous Collector Current	I_C	-3.5	A
Practical Power Dissipation*	P_{totp}	1.58	W
Power Dissipation at T_{amb}=25°C	P_{tot}	1.2	W
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +200	°C

*The power which can be dissipated assuming the device is mounted in a typical manner on a P.C.B. with copper equal to 1 inch square minimum

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated)

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	-140	-170		V	I_C=-100μA
Collector-Emitter Breakdown Voltag	$V_{(BR)CER}$	-140	-170		V	I_C=-1μA, RB ≤1KΩ
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	-100	-120		V	I_C=-10mA*
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	-6	-8		V	I_E=-100μA
Collector Cut-Off Current	I_{CBO}			-50 -1	nA μA	V_{CB}=-100V V_{CB}=-100V, T_{amb}=100°C
Collector Cut-Off Current	I_{CER} R ≤1KΩ			-50 -1	nA μA	V_{CB}=-100V V_{CB}=-100V, T_{amb}=100°C
Emitter Cut-Off Current	I_{EBO}			-10	nA	V_{EB}=-6V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$		-20 -80 -140 -250	-50 -100 -170 -330	mV mV mV mV	I_C=-100mA, I_B=-10mA* I_C=-1A, I_B=-100mA* I_C=-2A, I_B=-200mA* I_C=-4A, I_B=-400mA*
Base-Emitter Saturation Voltage	$V_{BE(sat)}$		-960	-1100	mV	I_C=-4A, I_B=-400mA*

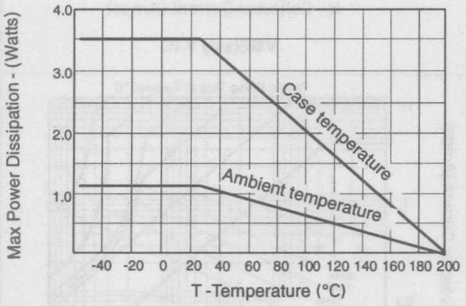
ELECTRICAL CHARACTERISTICS (at $T_{amb} = 25°C$)

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Base-Emitter Turn-On Voltage	$V_{BE(on)}$		-880	-1100	mV	I_C=-4A, V_{CE}=-1V*
Static Forward Current Transfer	h_{FE}	100 100 50 30	200 200 90 50 15	 300		I_C=-10mA, V_{CE}=-1V* I_C=-1A, V_{CE}=-1V* I_C=-3A, V_{CE}=-1V* I_C=-4A, V_{CE}=-1V* I_C=-10A, V_{CE}=-1V*
Transition Frequency	f_T		125		MHz	I_C=-100mA, V_{CE}=-10V f=50MHz
Output Capacitance	C_{obo}		65		pF	V_{CB}=-10V, f=1MHz
Switching Times	t_{on} t_{off}		110 460		ns ns	I_C=-2A, I_{B1}=-200mA I_{B2}=200mA, V_{CC}=-10V

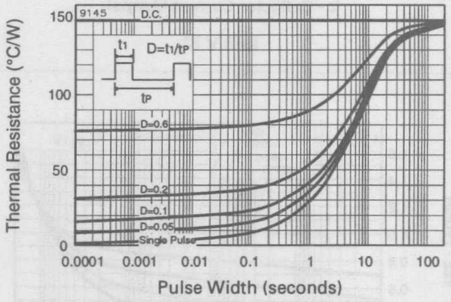
*Measured under pulsed conditions. Pulse width=300µs. Duty cycle ≤2%

THERMAL CHARACTERISTICS

PARAMETER	SYMBOL	MAX.	UNIT
Thermal Resistance: Junction to Ambient Junction to Case	$R_{th(j-amb)}$ $R_{th(j-case)}$	150 50	°C/W °C/W

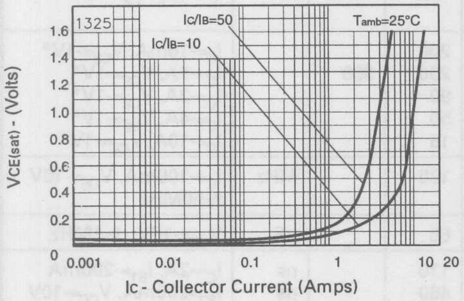


Derating curve

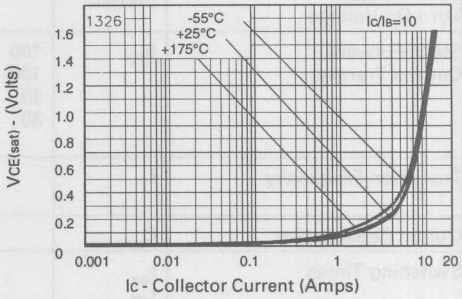


Maximum transient thermal impedance

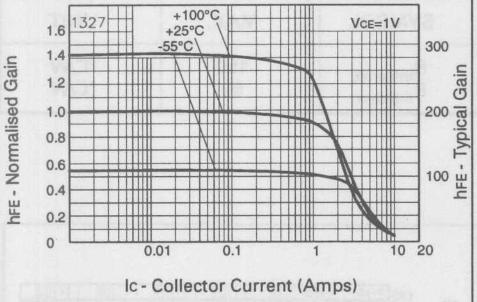
TYPICAL CHARACTERISTICS



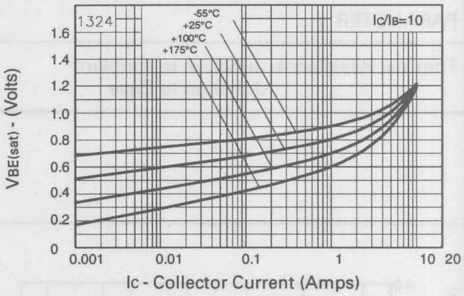
VCE(sat) v IC



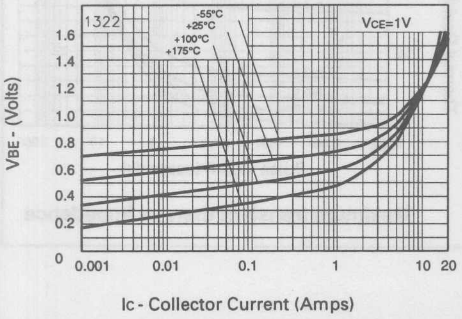
VCE(sat) v IC



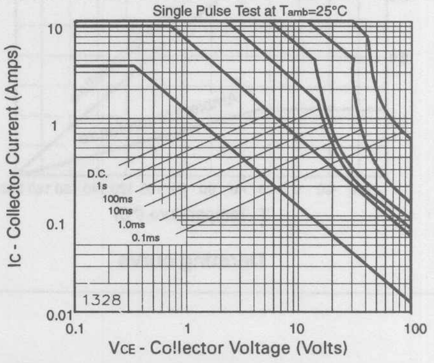
hFE v IC



VBE(sat) v IC



VBE(on) v IC



Safe Operating Area

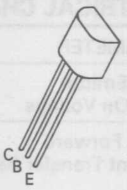
PNP SILICON PLANAR MEDIUM POWER HIGH CURRENT TRANSISTOR

ZTX955

ISSUE 3 – JUNE 94

FEATURES

- 3 Amps continuous current
- Up to 10 Amps peak current
- Very low saturation voltage
- Excellent gain characteristics up to 3 Amps
- Spice model available



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	-180	V
Collector-Emitter Voltage	V_{CEO}	-140	V
Emitter-Base Voltage	V_{EBO}	-6	V
Peak Pulse Current	I_{CM}	-10	A
Continuous Collector Current	I_C	-3	A
Practical Power Dissipation*	P_{totp}	1.58	W
Power Dissipation at T_{amb}=25°C	P_{tot}	1.2	W
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +200	°C

*The power which can be dissipated assuming the device is mounted in a typical manner on a P.C.B. with copper equal to 1 inch square minimum

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated)

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	-180	-210		V	I_C=-100μA
Collector-Emitter Breakdown Voltag	$V_{(BR)CER}$	-180	-210		V	I_C=-1μA, RB ≤1KΩ
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	-140	-170		V	I_C=-10mA*
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	-6	-8		V	I_E=-100μA
Collector Cut-Off Current	I_{CBO}			-50 -1	nA μA	V_{CB}=-150V V_{CB}=-150V, T_{amb}=100°C
Collector Cut-Off Current	I_{CER} R ≤1KΩ			-50 -1	nA μA	V_{CB}=-150V V_{CB}=-150V, T_{amb}=100°C
Emitter Cut-Off Current	I_{EBO}			-10	nA	V_{EB}=-6V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$		-30 -60 -90 -250	-60 -100 -120 -330	mV mV mV mV	I_C=-100mA, I_B=-5mA* I_C=-500mA, I_B=-50mA* I_C=-1A, I_B=-100mA* I_C=-3A, I_B=-300mA*
Base-Emitter Saturation Voltage	$V_{BE(sat)}$		-920	-1050	mV	I_C=-3A, I_B=-300mA*

ZTX955

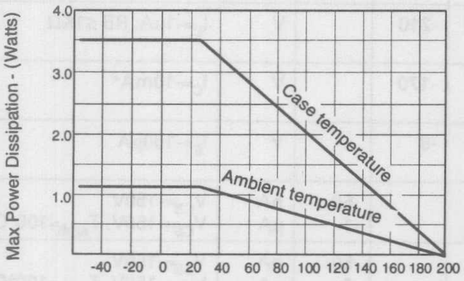
ELECTRICAL CHARACTERISTICS (at $T_{amb} = 25°C$)

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Base-Emitter Turn-On Voltage	$V_{BE(on)}$		-790	-900	mV	I_C=-3A, V_{CE}=-5V*
Static Forward Current Transfer Ratio	h_{FE}	100 100 75	200 200 140 10	 300		I_C=-10mA, V_{CE}=-5V* I_C=-1A, V_{CE}=-5V* I_C=-3A, V_{CE}=-5V* I_C=-10A, V_{CE}=-5V*
Transition Frequency	f_T		110		MHz	I_C=-100mA, V_{CE}=-10V f=50MHz
Output Capacitance	C_{obo}		40		pF	V_{CB}=-20V, f=1MHz
Switching Times	t_{on} t_{off}		68 1030		ns ns	I_C=-1A, I_{B1}=-100mA I_{B2}=100mA, V_{CC}=-50V

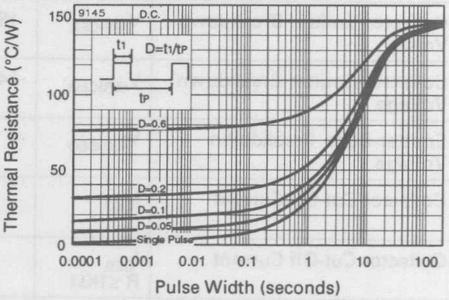
*Measured under pulsed conditions. Pulse width=300µs. Duty cycle ≤2%

THERMAL CHARACTERISTICS

PARAMETER	SYMBOL	MAX.	UNIT
Thermal Resistance: Junction to Ambient Junction to Case	$R_{th(j-amb)}$ $R_{th(j-case)}$	150 50	°C/W °C/W



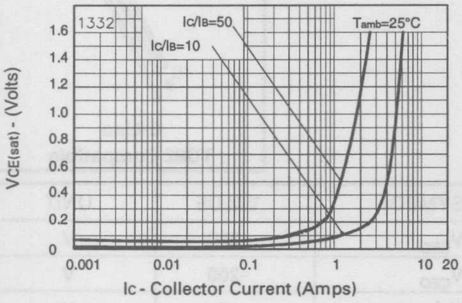
Derating curve



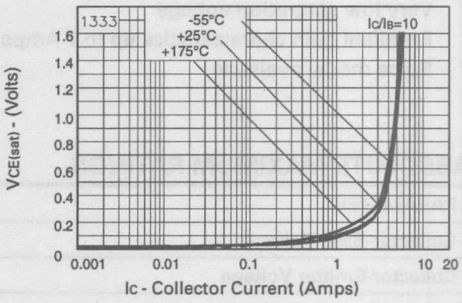
Maximum transient thermal impedance

ZTX955

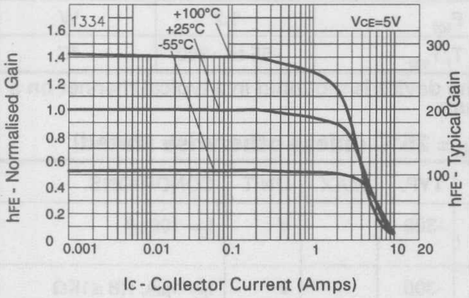
TYPICAL CHARACTERISTICS



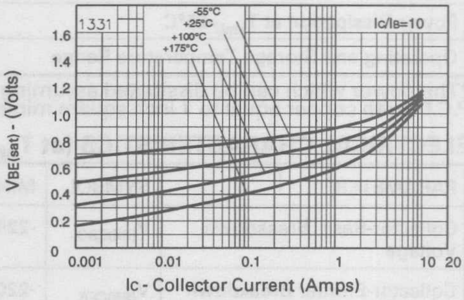
VCE(sat) v IC



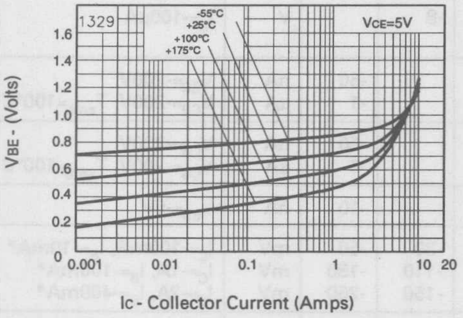
VCE(sat) v IC



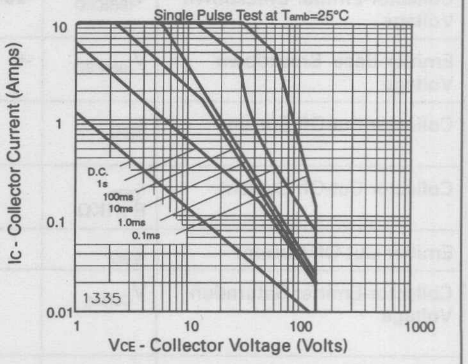
hFE v IC



VBE(sat) v IC



VBE(on) v IC



Safe Operating Area

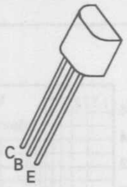
PNP SILICON PLANAR MEDIUM POWER HIGH CURRENT TRANSISTOR

ISSUE 3 – JUNE 94

ZTX956

FEATURES

- 2 Amps continuous current
- Up to 5 Amps peak current
- Very low saturation voltage
- Excellent gain characteristics up to 2 Amps
- Spice model available



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	-220	V
Collector-Emitter Voltage	V_{CEO}	-200	V
Emitter-Base Voltage	V_{EBO}	-6	V
Peak Pulse Current	I_{CM}	-5	A
Continuous Collector Current	I_C	-2	A
Practical Power Dissipation*	P_{totp}	1.58	W
Power Dissipation at T_{amb}=25°C	P_{tot}	1.2	W
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +200	°C

*The power which can be dissipated assuming the device is mounted in a typical manner on a P.C.B. with copper equal to 1 inch square minimum

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated)

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	-220	-300		V	I_C=-100μA
Collector-Emitter Breakdown Voltag	$V_{(BR)CER}$	-220	-300		V	I_C=-1μA, RB ≤1KΩ
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	-200	-240		V	I_C=-10mA*
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	-6	-8		V	I_E=-100μA
Collector Cut-Off Current	I_{CBO}			-50 -1	nA μA	V_{CB}=-200V V_{CB}=-200V, T_{amb}=100°C
Collector Cut-Off Current	I_{CER} R ≤1KΩ			-50 -1	nA μA	V_{CB}=-200V V_{CB}=-200V, T_{amb}=100°C
Emitter Cut-Off Current	I_{EBO}			-10	nA	V_{EB}=-6V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$		-30 -110 -150	-50 -150 -250	mV mV mV	I_C=-100mA, I_B=-10mA* I_C=-1A, I_B=-100mA* I_C=-2A, I_B=-400mA*
Base-Emitter Saturation Voltage	$V_{BE(sat)}$		-920	-1050	mV	I_C=-2A, I_B=-400mA

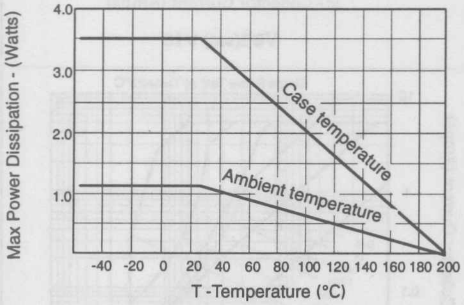
ELECTRICAL CHARACTERISTICS (at $T_{amb} = 25°C$)

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Base-Emitter Turn-On Voltage	$V_{BE(on)}$		-770	-900	mV	I_C=-2A, V_{CE}=-5V*
Static Forward Current Transfer Ratio	h_{FE}	100 100 50	200 200 150 10	 300		I_C=-10mA, V_{CE}=-5V* I_C=-1A, V_{CE}=-5V* I_C=-2A, V_{CE}=-5V* I_C=-5A, V_{CE}=-5V*
Transition Frequency	f_T		110		MHz	I_C=-100mA, V_{CE}=-10V f=50MHz
Output Capacitance	C_{obo}		32		pF	V_{CB}=-20V, f=1MHz
Switching Times	t_{on} t_{off}		67 1140		ns ns	I_C=-1A, I_{B1}=-100mA I_{B2}=100mA, V_{CC}=-50V

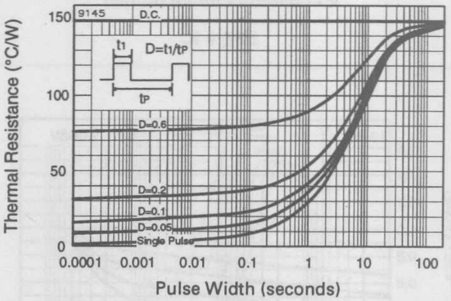
*Measured under pulsed conditions. Pulse width=300µs. Duty cycle ≤2%

THERMAL CHARACTERISTICS

PARAMETER	SYMBOL	MAX.	UNIT
Thermal Resistance: Junction to Ambient Junction to Case	$R_{th(j-amb)}$ $R_{th(j-case)}$	150 50	°C/W °C/W



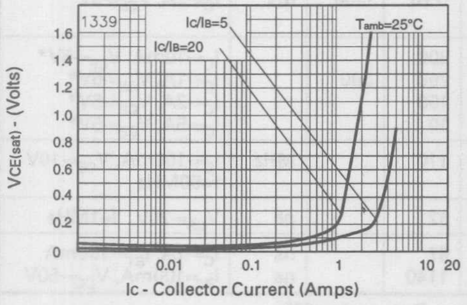
Derating curve



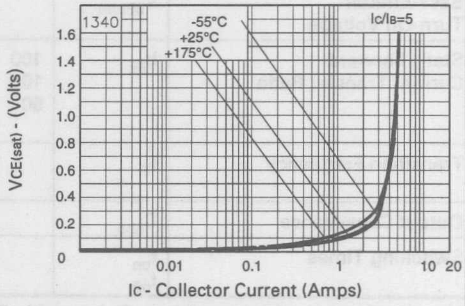
Maximum transient thermal impedance

ZTX956

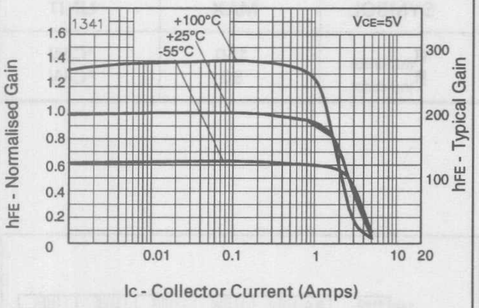
TYPICAL CHARACTERISTICS



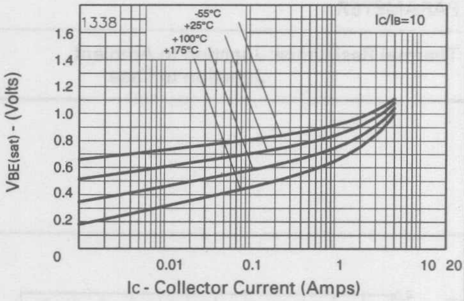
$V_{CE(sat)}$ v I_C



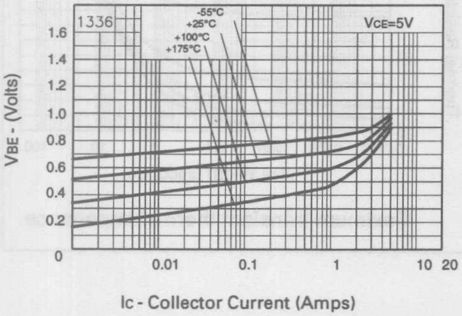
$V_{CE(sat)}$ v I_C



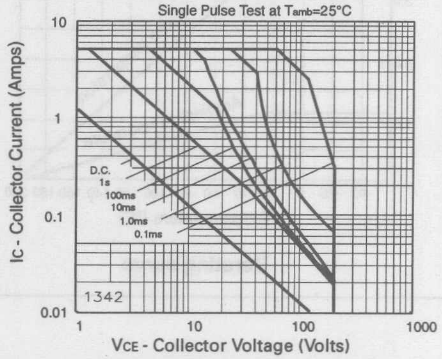
h_{FE} v I_C



$V_{BE(sat)}$ v I_C



$V_{BE(on)}$ v I_C



Safe Operating Area

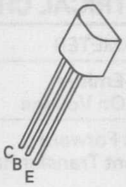
PNP SILICON PLANAR MEDIUM POWER HIGH CURRENT TRANSISTOR

ZTX957

ISSUE 3 – JUNE 94

FEATURES

- 1 Amp continuous current
- Up to 2 Amps peak current
- Very low saturation voltage
- Excellent gain characteritics up to 1 Amp
- Spice model available



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	-330	V
Collector-Emitter Voltage	V_{CEO}	-300	V
Emitter-Base Voltage	V_{EBO}	-6	V
Peak Pulse Current	I_{CM}	-2	A
Continuous Collector Current	I_C	-1	A
Practical Power Dissipation*	P_{totp}	1.58	W
Power Dissipation at T_{amb}=25°C	P_{tot}	1.2	W
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +200	°C

*The power which can be dissipated assuming the device is mounted in a typical manner on a P.C.B. with copper equal to 1 inch square minimum

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated)

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	-330	-440		V	I_C=-100μA
Collector-Emitter Breakdown Voltag	$V_{(BR)CER}$	-330	-440		V	I_C=-1μA, RB ≤1KΩ
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	-300	-400		V	I_C=-10mA*
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	-6	-8		V	I_E=-100μA
Collector Cut-Off Current	I_{CBO}			-50 -1	nA μA	V_{CB}=-300V V_{CB}=-300V, T_{amb}=100°C
Collector Cut-Off Current	I_{CER} R ≤1KΩ			-50 -1	nA μA	V_{CB}=-300V V_{CB}=-300V, T_{amb}=100°C
Emitter Cut-Off Current	I_{EBO}			-10	nA	V_{EB}=-6V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$		-60 -100 -140	-100 -150 -200	mV mV mV	I_C=-100mA, I_B=-10mA* I_C=-500mA, I_B=-100mA* I_C=-1A, I_B=-300mA*
Base-Emitter Saturation Voltage	$V_{BE(sat)}$		-870	-1000	mV	I_C=-1A, I_B=-300mA*

ZTX957

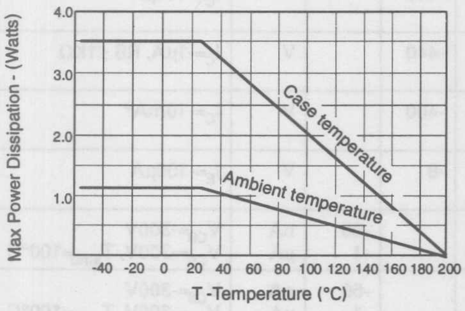
ELECTRICAL CHARACTERISTICS (at $T_{amb} = 25°C$)

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Base-Emitter Turn-On Voltage	$V_{BE(on)}$		-710	-850	mV	I_C=-1A, V_{CE}=-10V*
Static Forward Current Transfer Ratio	h_{FE}	100 100 90	200 200 170 10	 300		I_C=-10mA, V_{CE}=-10V* I_C=-0.5A, V_{CE}=-10V* I_C=-1A, V_{CE}=-10V* I_C=-2A, V_{CE}=-10V*
Transition Frequency	f_T		85		MHz	I_C=-100mA, V_{CE}=-10V f=50MHz
Output Capacitance	C_{obo}		23		pF	V_{CB}=-20V, f=1MHz
Switching Times	t_{on} t_{off}		108 2500		ns ns	I_C=-500mA, I_{B1}=-50mA I_{B2}=50mA, V_{CC}=-100V

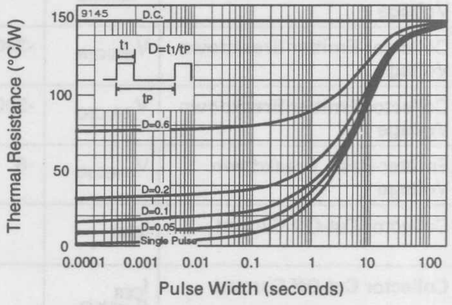
*Measured under pulsed conditions. Pulse width=300µs. Duty cycle ≤2%

THERMAL CHARACTERISTICS

PARAMETER	SYMBOL	MAX.	UNIT
Thermal Resistance: Junction to Ambient	$R_{th(j-amb)}$	150	°C/W
Junction to Case	$R_{th(j-case)}$	50	°C/W



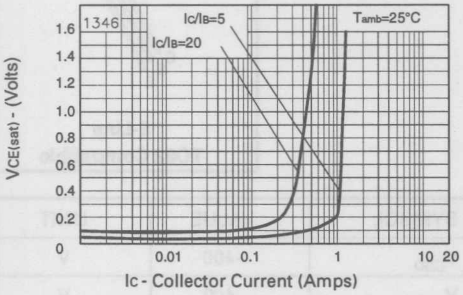
Derating curve



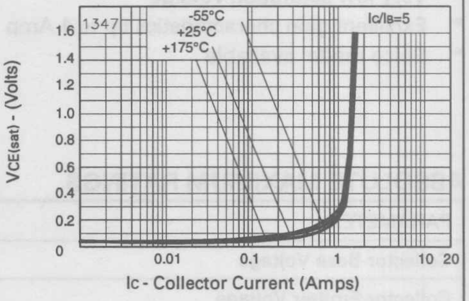
Maximum transient thermal impedance

ZTX957

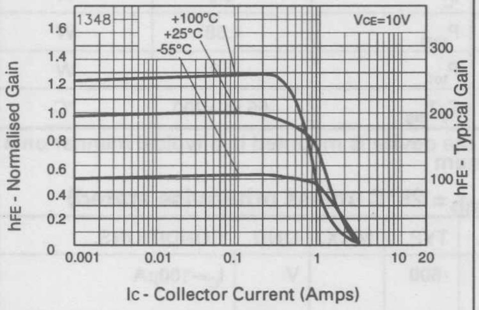
TYPICAL CHARACTERISTICS



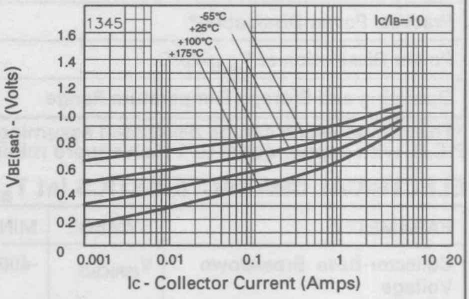
$V_{CE(sat)}$ v I_C



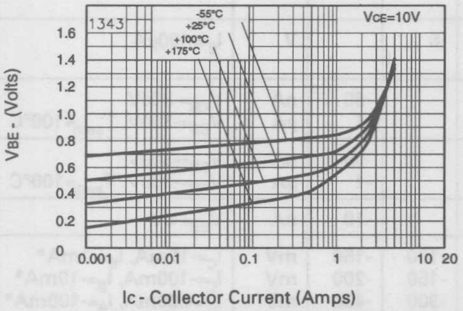
$V_{CE(sat)}$ v I_C



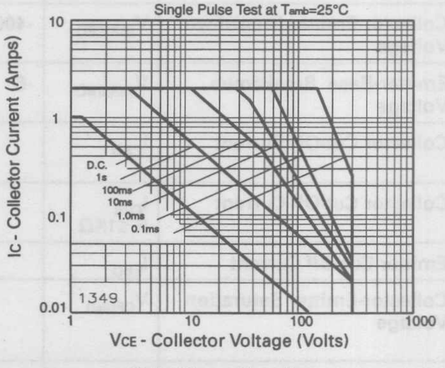
h_{FE} v I_C



$V_{BE(sat)}$ v I_C



$V_{BE(on)}$ v I_C



Safe Operating Area

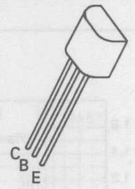
PNP SILICON PLANAR MEDIUM POWER HIGH CURRENT TRANSISTOR

ISSUE 3 – JUNE 94

ZTX958

FEATURES

- 0.5 Amp continuous current
- Up to 1.5 Amps peak current
- Very low saturation voltage
- Excellent gain characteristics up to 1 Amp
- Spice model available



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	-400	V
Collector-Emitter Voltage	V_{CEO}	-400	V
Emitter-Base Voltage	V_{EBO}	-6	V
Peak Pulse Current	I_{CM}	-1.5	A
Continuous Collector Current	I_C	-0.5	A
Practical Power Dissipation*	P_{totp}	1.58	W
Power Dissipation at T_{amb}=25°C	P_{tot}	1.2	W
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +200	°C

*The power which can be dissipated assuming the device is mounted in a typical manner on a P.C.B. with copper equal to 1 inch square minimum

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated)

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	-400	-600		V	I_C=-100μA
Collector-Emitter Breakdown Voltag	$V_{(BR)CER}$	-400	-600		V	I_C=-1μA, RB ≤1KΩ
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	-400	-550		V	I_C=-10mA*
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	-6	-8		V	I_E=-100μA
Collector Cut-Off Current	I_{CBO}			-50 -1	nA μA	V_{CB}=-300V V_{CB}=-300V, T_{amb}=100°C
Collector Cut-Off Current	I_{CER} R ≤1KΩ			-50 -1	nA μA	V_{CB}=-300V V_{CB}=-300V, T_{amb}=100°C
Emitter Cut-Off Current	I_{EBO}			-10	nA	V_{EB}=-6V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$		-100 -150 -300	-150 -200 -400	mV mV mV	I_C=-10mA, I_B=-1mA* I_C=-100mA, I_B=-10mA* I_C=-500mA, I_B=-100mA*
Base-Emitter Saturation Voltage	$V_{BE(sat)}$		-790	-900	mV	I_C=-500mA, I_B=-100mA*

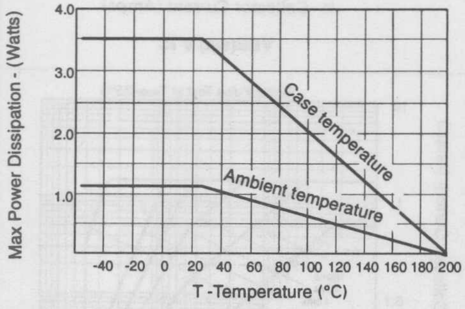
ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C)

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Base-Emitter Turn-On Voltage	$V_{BE(on)}$		-690	-800	mV	I_C=-500mA, V_{CE}=-10V*
Static Forward Current Transfer Ratio	h_{FE}	100 100 10	200 200 20	 300 		I_C=-10mA, V_{CE}=-10V* I_C=-500mA, V_{CE}=-10V* I_C=-1A, V_{CE}=-10V*
Transition Frequency	f_T		85		MHz	I_C=-100mA, V_{CE}=-10V f=50MHz
Output Capacitance	C_{obo}		19		pF	V_{CB}=-20V, f=1MHz
Switching Times	t_{on} t_{off}		104 2400		ns ns	I_C=-500mA, I_{B1}=-50mA I_{B2}=50mA, V_{CC}=-100V

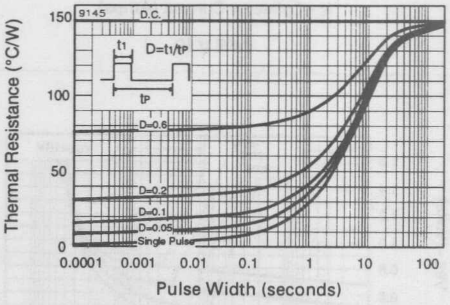
*Measured under pulsed conditions. Pulse width=300µs. Duty cycle ≤2%

THERMAL CHARACTERISTICS

PARAMETER	SYMBOL	MAX.	UNIT
Thermal Resistance: Junction to Ambient Junction to Case	$R_{th(j-amb)}$ $R_{th(j-case)}$	150 50	°C/W °C/W



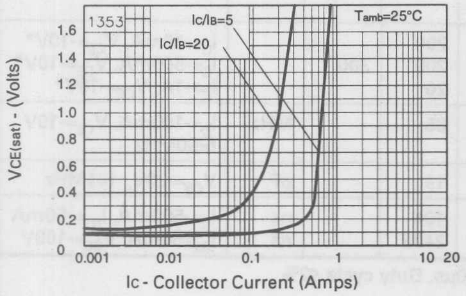
Derating curve



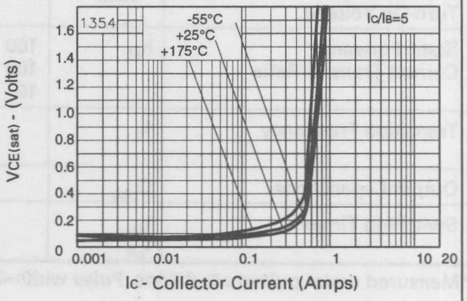
Maximum transient thermal impedance

ZTX958

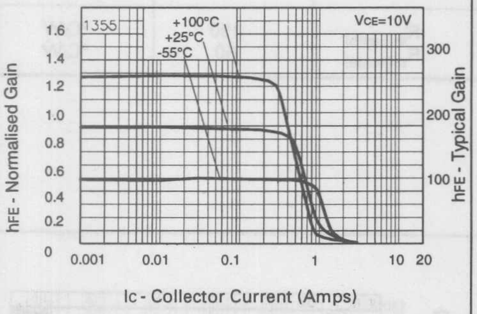
TYPICAL CHARACTERISTICS



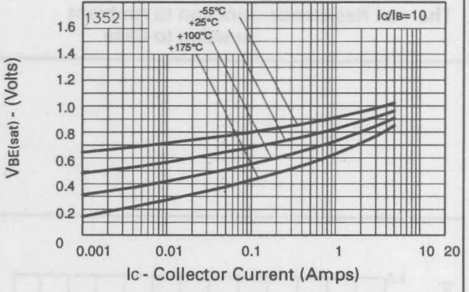
$V_{CE(sat)}$ v I_C



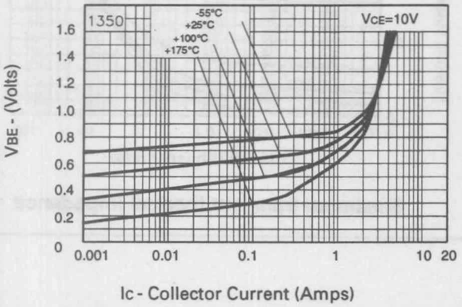
$V_{CE(sat)}$ v I_C



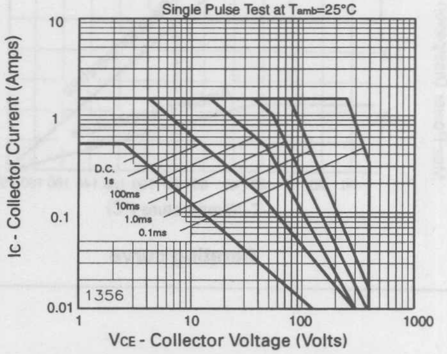
h_{FE} v I_C



$V_{BE(sat)}$ v I_C



$V_{BE(on)}$ v I_C



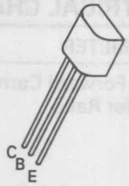
Safe Operating Area

PNP SILICON PLANAR MEDIUM POWER HIGH CURRENT TRANSISTOR

ZTX968

ISSUE 2 – JUNE 94

FEATURES
- 4.5 Amps continuous current
- Up to 20 Amps peak current
- Very low saturation voltage
- High gain
- Spice model available



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	-15	V
Collector-Emitter Voltage	V_{CEO}	-12	V
Emitter-Base Voltage	V_{EBO}	-6	V
Peak Pulse Current	I_{CM}	-20	A
Continuous Collector Current	I_C	-4.5	A
Practical Power Dissipation*	P_{totp}	1.58	W
Power Dissipation at T_{amb}=25°C	P_{tot}	1.2	W
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +200	°C

*The power which can be dissipated assuming the device is mounted in a typical manner on a P.C.B. with copper equal to 1 inch square minimum

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated)

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	-15	-28		V	I_C=-100μA
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	-12	-20		V	I_C=-10mA*
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	-6	-8		V	I_E=-100μA
Collector Cut-Off Current	I_{CBO}			-50 -1	nA μA	V_{CB}=-12V V_{CB}=-12V, T_{amb}=100°C
Emitter Cut-Off Current	I_{EBO}			-10	nA	V_{EB}=-6V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$		-50 -100 -220	-100 -150 -300	mV mV mV	I_C=-500mA, I_B=-5mA* I_C=-2A, I_B=-50mA* I_C=-5A, I_B=-200mA*
Base-Emitter Saturation Voltage	$V_{BE(sat)}$		-930	-1050	mV	I_C=-5A, I_B=-200mA*
Base-Emitter Turn-On Voltage	$V_{BE(on)}$		-830	-1000	mV	I_C=-5A, V_{CE}=-1V*

ZTX968

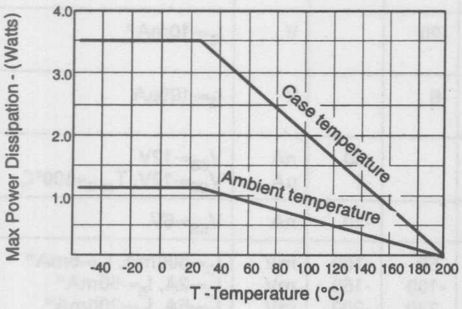
ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C)

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Static Forward Current Transfer Ratio	h_{FE}	300	450			I_C=-10mA, V_{CE}=-1V*
		300	450	1000		I_C=-500mA, V_{CE}=-1V*
		200	300			I_C=-5A, V_{CE}=-1V*
		150	240			I_C=-10A, V_{CE}=-1V*
			50			I_C=-20A, V_{CE}=-1V*
Transition Frequency	f_T		80		MHz	I_C=-100mA, V_{CE}=-10V f=50MHz
Output Capacitance	C_{obo}		161		pF	V_{CB}=-20V, f=1MHz
Switching Times	t_{on} t_{off}		120 116		ns ns	I_C=-4A, I_{B1}=-400mA I_{B2}=400mA, V_{CC}=-10V

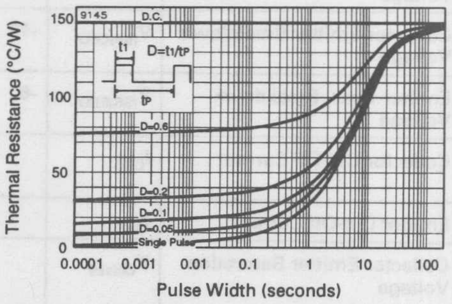
*Measured under pulsed conditions. Pulse width=300µs. Duty cycle ≤2%

THERMAL CHARACTERISTICS

PARAMETER	SYMBOL	MAX.	UNIT
Thermal Resistance: Junction to Ambient	$R_{th(j\text{-}amb)}$	150	°C/W
Junction to Case	$R_{th(j\text{-}case)}$	50	°C/W



Derating curve

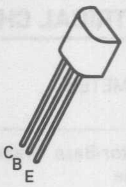


Maximum transient thermal impedance

NPN SILICON PLANAR MEDIUM POWER HIGH GAIN TRANSISTOR

ISSUE 2 - JANUARY 1995

ZTX1047A



E-Line
TO92 Compatible

Full characterised data now available

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	ZTX1047A	UNIT
Collector-Base Voltage	V_{CBO}	35	V
Collector-Emitter Voltage	V_{CEO}	10	V
Emitter-Base Voltage	V_{EBO}	5	V
Peak Pulse Current	I_{CM}	20	A
Continuous Collector Current	I_C	4	A
Base Current	I_B	500	mA
Power Dissipation at T_{amb}=25°C	P_{tot}	1	W
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +200	°C

ZTX1047A

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

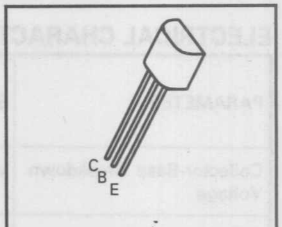
PARAMETER	SYMBOL	ZTX1047A			UNIT	CONDITIONS.
		MIN.	TYP.	MAX.		
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	35	55		V	I_C=100μA
Collector-Emitter Breakdown Voltage	V_{CES}	35	55		V	I_C=100μA
Collector-Emitter Breakdown Voltage	V_{CEO}	10	14		V	I_C=10mA
Collector-Emitter Breakdown Voltage	V_{CEV}	35	55		V	I_C=100μA, V_{EB}=1V
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	5	8.7		V	I_E=100μA
Collector Cut-Off Current	I_{CBO}		0.3	10	nA	V_{CB}=20V
Emitter Cut-Off Current	I_{EBO}		0.3	10	nA	V_{EB}=4V
Collector Emitter Cut-Off Current	I_{CES}		0.3	10	nA	V_{CES}=20V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$		23 44 120 130	40 70 185 190	mV mV mV mV	I_C=0.5A, I_B=10mA* I_C=1A, I_B=10mA* I_C=3A, I_B=10mA* I_C=4A, I_B=20mA*
Base-Emitter Saturation Voltage	$V_{BE(sat)}$		860	950	mV	I_C=4A, I_B=20mA*
Base-Emitter Turn-On Voltage	$V_{BE(on)}$		810	900	mV	I_C=4A, V_{CE}=2V*
Static Forward Current Transfer Ratio	h_{FE}	280 300 240 150 60	440 450 380 230 110	 1200		I_C=10mA, V_{CE}=2V* I_C=1A, V_{CE}=2V* I_C=4A, V_{CE}=2V* I_C=10A, V_{CE}=2V* I_C=20A, V_{CE}=2V*
Transition Frequency	f_T		150		MHz	I_C=50mA, V_{CE}=10V f=50MHz
Output Capacitance	C_{obo}		85	110	pF	V_{CB}=10V, f=1MHz

*Measured under pulsed conditions. Pulse width=300μs. Duty cycle ≤ 2%

NPN SILICON PLANAR MEDIUM POWER HIGH GAIN TRANSISTOR

ISSUE 2 - JANUARY 1995

ZTX1048A



E-Line
TO92 Compatible

Full characterised data now available

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	ZTX1048A	UNIT
Collector-Base Voltage	V_{CBO}	50	V
Collector-Emitter Voltage	V_{CEO}	17.5	V
Emitter-Base Voltage	V_{EBO}	5	V
Peak Pulse Current	I_{CM}	20	A
Continuous Collector Current	I_C	4	A
Base Current	I_B	500	mA
Power Dissipation at T_{amb}=25°C	P_{tot}	1	W
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +200	°C

ZTX1048A

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

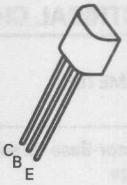
PARAMETER	SYMBOL	ZTX1048A			UNIT	CONDITIONS.
		MIN.	TYP.	MAX.		
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	50	85		V	I_C=100μA
Collector-Emitter Breakdown Voltage	V_{CES}	50	85		V	I_C=100μA
Collector-Emitter Breakdown Voltage	V_{CEO}	17.5	24		V	I_C=10mA
Collector-Emitter Breakdown Voltage	V_{CEV}	50	85		V	I_C=100μA, V_{EB}=1V
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	5	8.7		V	I_E=100μA
Collector Cut-Off Current	I_{CBO}		0.3	10	nA	V_{CB}=35V
Emitter Cut-Off Current	I_{EBO}		0.3	10	nA	V_{EB}=4V
Collector Emitter Cut-Off Current	I_{CES}		0.3	10	nA	V_{CES}=35V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$		27	45	mV	I_C=0.5A, I_B=10mA*
			55	75	mV	I_C=1A, I_B=10mA*
			110	150	mV	I_C=2A, I_B=10mA*
			210	245	mV	I_C=4A, I_B=20mA*
Base-Emitter Saturation Voltage	$V_{BE(sat)}$		860	950	mV	I_C=4A, I_B=20mA*
Base-Emitter Turn-On Voltage	$V_{BE(on)}$		860	950	mV	I_C=4A, V_{CE}=2V*
Static Forward Current Transfer Ratio	h_{FE}	280	440			I_C=10mA, V_{CE}=2V*
		300	450			I_C=0.5A, V_{CE}=2V*
		300	450	1200		I_C=1A, V_{CE}=2V*
		220	330			I_C=4A, V_{CE}=2V*
		50	80			I_C=20A, V_{CE}=2V*
Transition Frequency	f_T		150		MHz	I_C=50mA, V_{CE}=10V f=50MHz
Output Capacitance	C_{obo}		60	80	pF	V_{CB}=10V, f=1MHz

*Measured under pulsed conditions. Pulse width=300μs. Duty cycle ≤ 2%

NPN SILICON PLANAR MEDIUM POWER HIGH GAIN TRANSISTOR

DRAFT DATA ISSUE A - NOVEMBER 1994

ZTX1049A



E-Line
TO92 Compatible

Full characterised data now available

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	80	V
Collector-Emitter Voltage	V_{CEO}	30	V
Emitter-Base Voltage	V_{EBO}	5	V
Peak Pulse Current	I_{CM}	15	A
Continuous Collector Current	I_C	4	A
Base Current	I_B	500	mA
Power Dissipation at T_{amb}=25°C	P_{tot}	1	W
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +200	°C

ZTX1049A

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

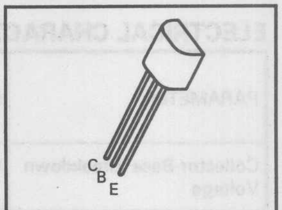
PARAMETER	SYMBOL	ZTX1049A			UNIT	CONDITIONS.
		MIN.	TYP.	MAX.		
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	80	120		V	I_C=100μA
Collector-Emitter Breakdown Voltage	V_{CES}	80	120		V	I_C=100μA
Collector-Emitter Breakdown Voltage	V_{CEO}	30	40		V	I_C=10mA
Collector-Emitter Breakdown Voltage	V_{CEV}	80	120		V	I_C=100μA, V_{EB}=1V
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	5	8.8		V	I_E=100μA
Collector Cut-Off Current	I_{CBO}		0.3	10	nA	V_{CB}=35V
Emitter Cut-Off Current	I_{EBO}		0.3	10	nA	V_{EB}=4V
Collector Emitter Cut-Off Current	I_{CES}		0.3	10	nA	V_{CES}=35V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$		35 70 120 210	60 100 180 245	mV mV mV mV	I_C=0.5A, I_B=10mA* I_C=1A, I_B=10mA* I_C=2A, I_B=10mA* I_C=4A, I_B=50mA*
Base-Emitter Saturation Voltage	$V_{BE(sat)}$		840	950	mV	I_C=4A, I_B=50mA*
Base-Emitter Turn-On Voltage	$V_{BE(on)}$		840	950	mV	I_C=4A, V_{CE}=2V*
Static Forward Current Transfer Ratio	h_{FE}	280 300 300 200 50	440 450 450 320 80	 1200 		I_C=10mA, V_{CE}=2V* I_C=0.5A, V_{CE}=2V* I_C=1A, V_{CE}=2V* I_C=4A, V_{CE}=2V* I_C=15A, V_{CE}=2V*
Transition Frequency	f_T		100		MHz	I_C=50mA, V_{CE}=10V f=100MHz
Output Capacitance	C_{obo}		45		pF	V_{CB}=10V, f=1MHz

*Measured under pulsed conditions. Pulse width=300μs. Duty cycle ≤ 2%

NPN SILICON PLANAR MEDIUM POWER HIGH GAIN TRANSISTOR

ISSUE 2 - JANUARY 1995

ZTX1051A



E-Line
TO92 Compatible

Full characterised data now available

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	ZTX1051A	UNIT
Collector-Base Voltage	V_{CBO}	150	V
Collector-Emitter Voltage	V_{CEO}	40	V
Emitter-Base Voltage	V_{EBO}	5	V
Peak Pulse Current	I_{CM}	10	A
Continuous Collector Current	I_C	4	A
Base Current	I_B	500	mA
Power Dissipation at T_{amb}=25°C	P_{tot}	1	W
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +200	°C

ZTX1051A

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

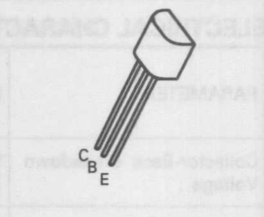
PARAMETER	SYMBOL	ZTX1051A			UNIT	CONDITIONS.
		MIN.	TYP.	MAX.		
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	150	190		V	I_C=100μA
Collector-Emitter Breakdown Voltage	V_{CES}	150	190		V	I_C=100μA
Collector-Emitter Breakdown Voltage	V_{CEO}	40	60		V	I_C=10mA
Collector-Emitter Breakdown Voltage	V_{CEV}	150	190		V	I_C=100μA, V_{EB}=1V
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	5	8.8		V	I_E=100μA
Collector Cut-Off Current	I_{CBO}		0.3	10	nA	V_{CB}=120V
Emitter Cut-Off Current	I_{EBO}		0.3	10	nA	V_{EB}=4V
Collector Emitter Cut-Off Current	I_{CES}		0.3	10	nA	V_{CES}=120V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$		17 75 165	25 110 210	mV mV mV	I_C=0.2A, I_B=10mA* I_C=1A, I_B=10mA* I_C=4A, I_B=100mA*
Base-Emitter Saturation Voltage	$V_{BE(sat)}$		920	1000	mV	I_C=4A, I_B=100mA*
Base-Emitter Turn-On Voltage	$V_{BE(on)}$		825	950	mV	I_C=4A, V_{CE}=2V*
Static Forward Current Transfer Ratio	h_{FE}	290 300 190 45	440 450 310 70	 1200 		I_C=10mA, V_{CE}=2V* I_C=1A, V_{CE}=2V* I_C=4A, V_{CE}=2V* I_C=10A, V_{CE}=2V*
Transition Frequency	f_T		155		MHz	I_C=50mA, V_{CE}=10V f=100MHz
Output Capacitance	C_{obo}		27	40	pF	V_{CB}=10V, f=1MHz

*Measured under pulsed conditions. Pulse width=300μs. Duty cycle ≤ 2%

NPN SILICON PLANAR MEDIUM POWER HIGH GAIN TRANSISTOR

ISSUE 2 - JANUARY 1995

ZTX1053A



E-Line
TO92 Compatible

Full characterised data now available

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	ZTX1053A	UNIT
Collector-Base Voltage	V_{CBO}	150	V
Collector-Emitter Voltage	V_{CEO}	75	V
Emitter-Base Voltage	V_{EBO}	5	V
Peak Pulse Current	I_{CM}	10	A
Continuous Collector Current	I_C	3	A
Base Current	I_B	500	mA
Power Dissipation at T_{amb}=25°C	P_{tot}	1	W
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +200	°C

ZTX1053A

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

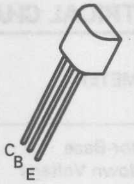
PARAMETER	SYMBOL	ZTX1053A			UNIT	CONDITIONS.
		MIN.	TYP.	MAX.		
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	150	245		V	$I_C=100\mu A$
Collector-Emitter Breakdown Voltage	V_{CES}	150	245		V	$I_C=100\mu A$
Collector-Emitter Breakdown Voltage	V_{CEO}	75	100		V	$I_C=10mA$
Collector-Emitter Breakdown Voltage	V_{CEV}	150	245		V	$I_C=100\mu A$, $V_{EB}=1V$
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	5	8.8		V	$I_E=100\mu A$
Collector Cut-Off Current	I_{CBO}		0.3	10	nA	$V_{CB}=120V$
Emitter Cut-Off Current	I_{EBO}		0.3	10	nA	$V_{EB}=4V$
Collector Emitter Cut-Off Current	I_{CES}		0.3	10	nA	$V_{CES}=120V$
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$		17	25	mV	$I_C=0.2A$, $I_B=20mA$*
			120	150	mV	$I_C=1A$, $I_B=10mA$*
			180	250	mV	$I_C=3A$, $I_B=100mA$*
Base-Emitter Saturation Voltage	$V_{BE(sat)}$		900	1000	mV	$I_C=3A$, $I_B=100mA$*
Base-Emitter Turn-On Voltage	$V_{BE(on)}$		825	950	mV	$I_C=3A$, $V_{CE}=2V$*
Static Forward Current Transfer Ratio	h_{FE}	260	420			$I_C=10mA$, $V_{CE}=2V$*
		300	450	1200		$I_C=1A$, $V_{CE}=2V$*
		100	150			$I_C=3A$, $V_{CE}=2V$*
			15			$I_C=10A$, $V_{CE}=2V$*
Transition Frequency	f_T		140		MHz	$I_C=50mA$, $V_{CE}=10V$ f=100MHz
Output Capacitance	C_{obo}		21	30	pF	$V_{CB}=10V$, f=1MHz

*Measured under pulsed conditions. Pulse width=300μs. Duty cycle ≤ 2%

NPN SILICON PLANAR MEDIUM POWER HIGH GAIN TRANSISTOR

ISSUE 2 - JANUARY 1995

ZTX1055A



E-Line
TO92 Compatible

Full characterised data now available

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	ZTX1055A	UNIT
Collector-Base Voltage	V_{CBO}	175	V
Collector-Emitter Voltage	V_{CEO}	120	V
Emitter-Base Voltage	V_{EBO}	5	V
Peak Pulse Current	I_{CM}	6	A
Continuous Collector Current	I_C	3	A
Base Current	I_B	500	mA
Power Dissipation at T_{amb}=25°C	P_{tot}	1	W
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +200	°C

ZTX1055A

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

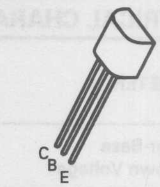
PARAMETER	SYMBOL	ZTX1055A			UNIT	CONDITIONS.
		MIN.	TYP.	MAX.		
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	175	280		V	I_C=100μA
Collector-Emitter Breakdown Voltage	V_{CES}	175	280		V	I_C=100μA
Collector-Emitter Breakdown Voltage	V_{CEO}	120	150		V	I_C=10mA
Collector-Emitter Breakdown Voltage	V_{CEV}	175	280		V	I_C=100μA, V_{EB}=1V
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	5	8.8		V	I_E=100μA
Collector Cut-Off Current	I_{CBO}		0.3	10	nA	V_{CB}=130V
Emitter Cut-Off Current	I_{EBO}		0.3	10	nA	V_{EB}=4V
Collector Emitter Cut-Off Current	I_{CES}		0.3	10	nA	V_{CES}=130V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$		22 120 220	50 160 310	mV mV mV	I_C=0.1A, I_B=5mA* I_C=1A, I_B=20mA* I_C=3A, I_B=150mA*
Base-Emitter Saturation Voltage	$V_{BE(sat)}$		950	1000	mV	I_C=3A, I_B=150mA*
Base-Emitter Turn-On Voltage	$V_{BE(on)}$		810	900	mV	I_C=3A, V_{CE}=10V*
Static Forward Current Transfer Ratio	h_{FE}	275 300 50 	400 450 110 15	 1200 		I_C=10mA, V_{CE}=10V* I_C=1A, V_{CE}=10V* I_C=3A, V_{CE}=10V* I_C=6A, V_{CE}=10V*
Transition Frequency	f_T		130		MHz	I_C=50mA, V_{CE}=10V f=100MHz
Output Capacitance	C_{obo}		17	30	pF	V_{CB}=10V, f=1MHz

*Measured under pulsed conditions. Pulse width=300μs. Duty cycle ≤ 2%

NPN SILICON PLANAR MEDIUM POWER HIGH GAIN TRANSISTOR

ISSUE 2 - JANUARY 1995

ZTX1056A



E-Line
TO92 Compatible

Full characterised data now available

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	ZTX1056A	UNIT
Collector-Base Voltage	V_{CBO}	200	V
Collector-Emitter Voltage	V_{CEO}	160	V
Emitter-Base Voltage	V_{EBO}	5	V
Peak Pulse Current	I_{CM}	6	A
Continuous Collector Current	I_C	3	A
Base Current	I_B	500	mA
Power Dissipation at T_{amb}=25°C	P_{tot}	1	W
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +200	°C

ZTX1056A

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

PARAMETER	SYMBOL	ZTX1056A			UNIT	CONDITIONS.
		MIN.	TYP.	MAX.		
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	200	310		V	I_C=100μA
Collector-Emitter Breakdown Voltage	V_{CES}	200	310		V	I_C=100μA
Collector-Emitter Breakdown Voltage	V_{CEO}	160	190		V	I_C=10mA
Collector-Emitter Breakdown Voltage	V_{CEV}	200	310		V	I_C=100μA, V_{EB}=1V
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	5	8.8		V	I_E=100μA
Collector Cut-Off Current	I_{CBO}		0.3	10	nA	V_{CB}=150V
Emitter Cut-Off Current	I_{EBO}		0.3	10	nA	V_{EB}=4V
Collector Emitter Cut-Off Current	I_{CES}		0.3	10	nA	V_{CES}=150V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$		25	60	mV	I_C=0.1A, I_B=5mA*
			95	140	mV	I_C=1A, I_B=50mA*
			175	250	mV	I_C=2A, I_B=100mA*
			220	300	mV	I_C=3A, I_B=200mA*
Base-Emitter Saturation Voltage	$V_{BE(sat)}$		950	1050	mV	I_C=3A, I_B=200mA*
Base-Emitter Turn-On Voltage	$V_{BE(on)}$		860	950	mV	I_C=3A, V_{CE}=10V*
Static Forward Current Transfer Ratio	h_{FE}	275	420			I_C=10mA, V_{CE}=10V*
		300	450	1200		I_C=0.5A, V_{CE}=10V*
		250	400			I_C=1A, V_{CE}=10V*
		60	120			I_C=2A, V_{CE}=10V*
		30	50			I_C=3A, V_{CE}=10V*
			15			I_C=6A, V_{CE}=10V*
Transition Frequency	f_T		120		MHz	I_C=50mA, V_{CE}=10V f=100MHz
Output Capacitance	C_{obo}		14	25	pF	V_{CB}=10V, f=1MHz

*Measured under pulsed conditions. Pulse width=300μs. Duty cycle ≤ 2%

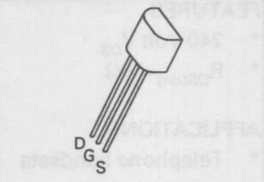
N-CHANNEL ENHANCEMENT MODE VERTICAL DMOS FET

ZVN0120A

ISSUE 2 – MARCH 94

FEATURES

- 200 Volt V_{DS}
- $R_{DS(on)}=16\Omega$



E-Line
TO92 Compatible

APPLICATIONS

- Telephone handsets

REFER TO ZVN0124A FOR GRAPHS

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Drain-Source Voltage	V_{DS}	200	V
Continuous Drain Current at T_{amb}=25°C	I_D	160	mA
Pulsed Drain Current	I_{DM}	2	A
Gate Source Voltage	V_{GS}	± 20	V
Power Dissipation at T_{amb}=25°C	P_{tot}	700	mW
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +150	°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

PARAMETER	SYMBOL	MIN.	MAX.	UNIT	CONDITIONS.
Drain-Source Breakdown Voltage	BV_{DSS}	200		V	I_D=1mA, V_{GS}=0V
Gate-Source Threshold Voltage	$V_{GS(th)}$	1	3	V	I_D=1mA, V_{DS}= V_{GS}
Gate-Body Leakage	I_{GSS}		20	nA	V_{GS}=± 20V, V_{DS}=0V
Zero Gate Voltage Drain Current	I_{DSS}		10 100	µA µA	V_{DS}=200 V, V_{GS}=0 V_{DS}=160 V, V_{GS}=0V, T=125°C(2)
On-State Drain Current(1)	$I_{D(on)}$	500		mA	V_{DS}=25 V, V_{GS}=10V
Static Drain-Source On-State Resistance (1)	$R_{DS(on)}$		16	Ω	V_{GS}=10V,I_D=250mA
Forward Transconductance (1)(2)	g_{fs}	100		mS	V_{DS}=25V,I_D=250mA
Input Capacitance (2)	C_{iss}		85	pF	V_{DS}=25 V, V_{GS}=0V, f=1MHz
Common Source Output Capacitance (2)	C_{oss}		20	pF	
Reverse Transfer Capacitance (2)	C_{rss}		7	pF	
Turn-On Delay Time (2)(3)	$t_{d(on)}$		7	ns	V_{DD}≈25V, I_D=250mA
Rise Time (2)(3)	t_r		8	ns	
Turn-Off Delay Time (2)(3)	$t_{d(off)}$		16	ns	
Fall Time (2)(3)	t_f		8	ns	

(1) Measured under pulsed conditions. Width=300µs. Duty cycle ≤2%
(2) Sample test.
(3) Switching times measured with 50Ω source impedance and <5ns rise time on a pulse generator

N-CHANNEL ENHANCEMENT MODE VERTICAL DMOS FET

ZVN0124A

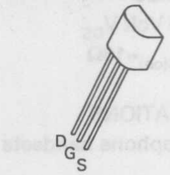
ISSUE 1 – MARCH 94

FEATURES

- 240 Volt V_{DS}
- $R_{DS(on)}=16\Omega$

APPLICATIONS

- Telephone handsets



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

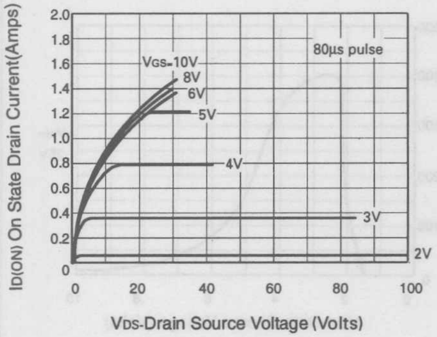
PARAMETER	SYMBOL	VALUE	UNIT
Drain-Source Voltage	V_{DS}	240	V
Continuous Drain Current at $T_{amb}=25°C$	I_D	160	mA
Pulsed Drain Current	I_{DM}	2	A
Gate Source Voltage	V_{GS}	± 20	V
Power Dissipation at $T_{amb}=25°C$	P_{tot}	700	mW
Operating and Storage Temperature Range	$T_j:T_{stg}$	-55 to +150	°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

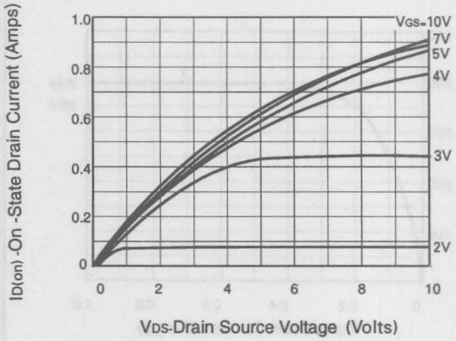
PARAMETER	SYMBOL	MIN.	MAX.	UNIT	CONDITIONS.
Drain-Source Breakdown Voltage	BV_{DSS}	240		V	I_D=1mA, V_{GS}=0V
Gate-Source Threshold Voltage	$V_{GS(th)}$	1	3	V	I_D=1mA, $V_{DS}=V_{GS}$
Gate-Body Leakage	I_{GSS}		20	nA	V_{GS}=± 20V, V_{DS}=0V
Zero Gate Voltage Drain Current	I_{DSS}		10 100	µA µA	V_{DS}=240 V, V_{GS}=0 V_{DS}=192 V, V_{GS}=0V, T=125°C(2)
On-State Drain Current(1)	$I_{D(on)}$	500		mA	V_{DS}=25 V, V_{GS}=10V
Static Drain-Source On-State Resistance (1)	$R_{DS(on)}$		16	Ω	V_{GS}=10V,I_D=250mA
Forward Transconductance (1)(2)	g_{fs}	100		mS	V_{DS}=25V,I_D=250mA
Input Capacitance (2)	C_{iss}		85	pF	V_{DS}=25 V, V_{GS}=0V, f=1MHz
Common Source Output Capacitance (2)	C_{oss}		20	pF	
Reverse Transfer Capacitance (2)	C_{rss}		7	pF	
Turn-On Delay Time (2)(3)	$t_{d(on)}$		7	ns	$V_{DD}\approx$25V, I_D=250mA
Rise Time (2)(3)	t_r		8	ns	
Turn-Off Delay Time (2)(3)	$t_{d(off)}$		16	ns	
Fall Time (2)(3)	t_f		8	ns	

(1) Measured under pulsed conditions. Width=300µs. Duty cycle ≤2%
(2) Sample test.
(3) Switching times measured with 50Ω source impedance and <5ns rise time on a pulse generator

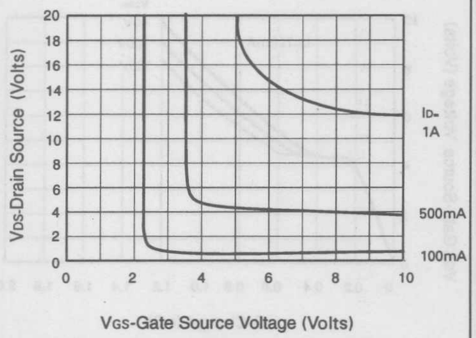
TYPICAL CHARACTERISTICS



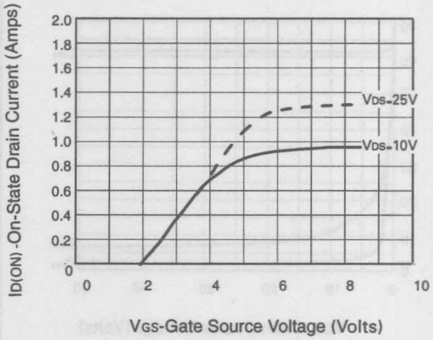
Output Characteristics



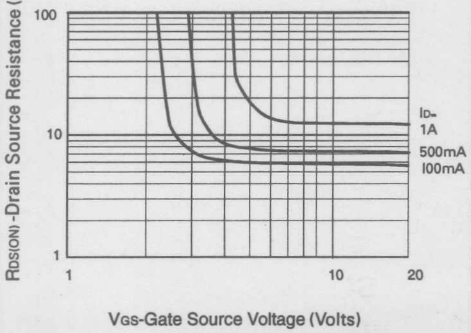
Saturation Characteristics



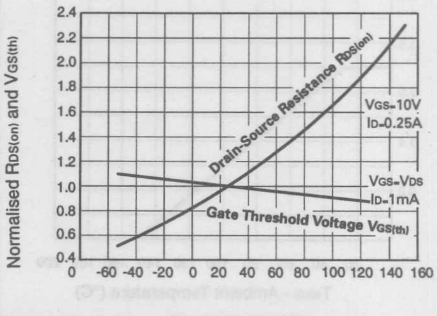
Voltage Saturation Characteristics



Transfer Characteristics

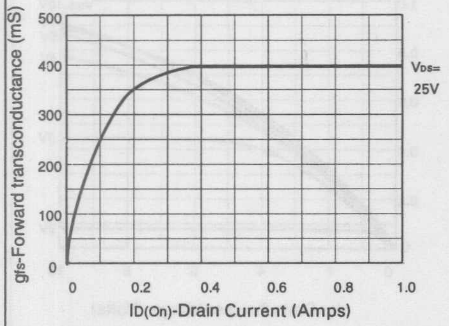


On-resistance vs gate-source voltage

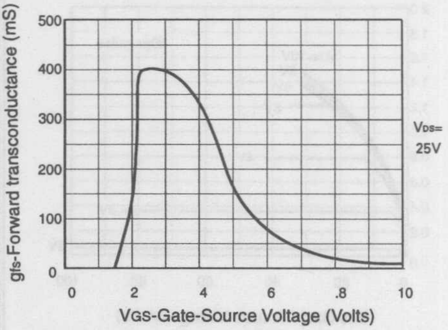


Normalised RDS(on) and VGS(th) V Temperature

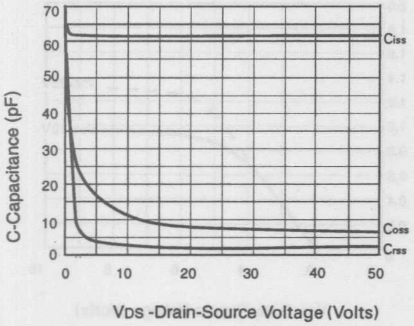
TYPICAL CHARACTERISTICS



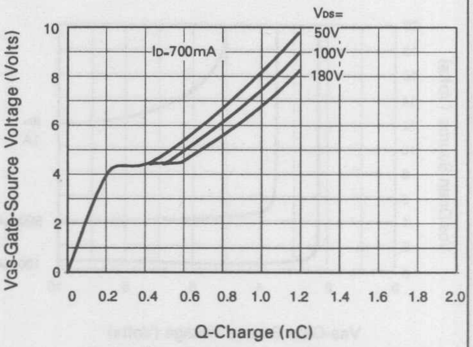
Transconductance v drain current



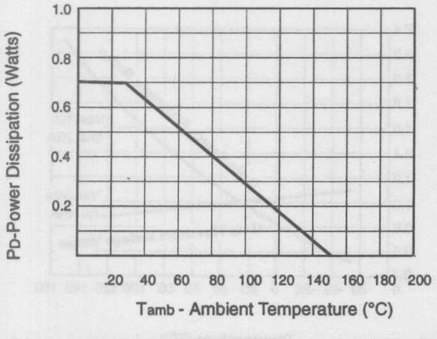
Transconductance v gate-source voltage



Capacitance v drain-source voltage



Gate charge v gate-source voltage



Power v temperature derating curve (ambient)

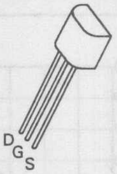
N-CHANNEL ENHANCEMENT MODE VERTICAL DMOS FET

ZVN0535A

ISSUE 2 – MARCH 94

FEATURES

- 350 Volt V_{DS}
- $R_{DS(on)}=50\Omega$



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Drain-Source Voltage	V_{DS}	350	V
Continuous Drain Current at T_{amb}=25°C	I_D	90	mA
Pulsed Drain Current	I_{DM}	600	mA
Gate Source Voltage	V_{GS}	± 20	V
Power Dissipation at T_{amb}=25°C	P_{tot}	700	mW
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +150	°C

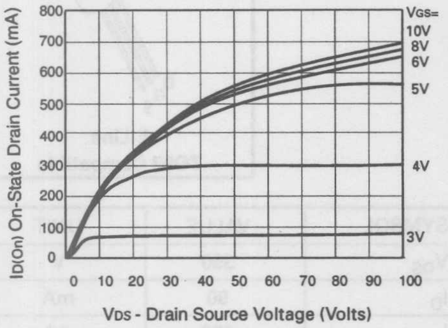
ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

PARAMETER	SYMBOL	MIN.	MAX.	UNIT	CONDITIONS.
Drain-Source Breakdown Voltage	BV_{DSS}	350		V	I_D=1mA, V_{GS}=0V
Gate-Source Threshold Voltage	$V_{GS(th)}$	1	3	V	I_D=1mA, V_{DS}= V_{GS}
Gate-Body Leakage	I_{GSS}		20	nA	V_{GS}=± 20V, V_{DS}=0V
Zero Gate Voltage Drain Current	I_{DSS}		10 400	µA µA	V_{DS}=350 V, V_{GS}=0 V_{DS}=280 V, V_{GS}=0V, T=125°C(2)
On-State Drain Current(1)	$I_{D(on)}$	150		mA	V_{DS}=25 V, V_{GS}=10V
Static Drain-Source On-State Resistance (1)	$R_{DS(on)}$		50	Ω	V_{GS}=10V,I_D=100mA
Forward Transconductance(1)(2)	g_{fs}	100		mS	V_{DS}=25V,I_D=100mA
Input Capacitance (2)	C_{iss}		70	pF	V_{DS}=25 V, V_{GS}=0V, f=1MHz
Common Source Output Capacitance (2)	C_{oss}		10	pF	
Reverse Transfer Capacitance (2)	C_{rss}		4	pF	
Turn-On Delay Time (2)(3)	$t_{d(on)}$		7	ns	V_{DD}≈25V, I_D=100mA
Rise Time (2)(3)	t_r		7	ns	
Turn-Off Delay Time (2)(3)	$t_{d(off)}$		16	ns	
Fall Time (2)(3)	t_f		10	ns	

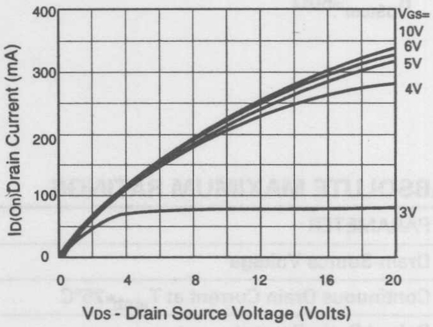
(1) Measured under pulsed conditions. Width=300µs. Duty cycle ≤2%
(2) Sample test.
(3) Switching times measured with 50Ω source impedance and <5ns rise time on a pulse generator

ZVN0535A

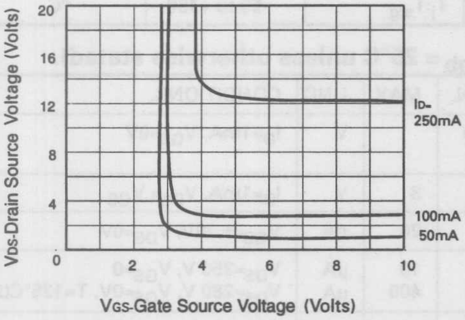
TYPICAL CHARACTERISTICS



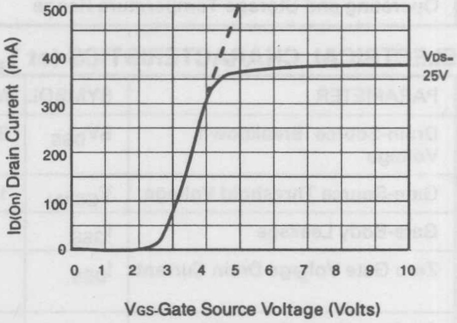
Output Characteristics



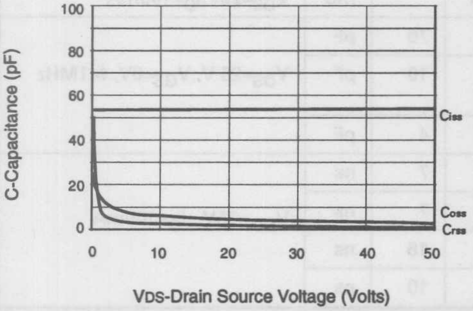
Saturation Characteristics



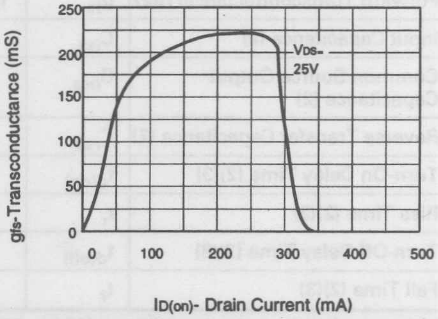
Voltage Saturation Characteristics



Transfer Characteristics



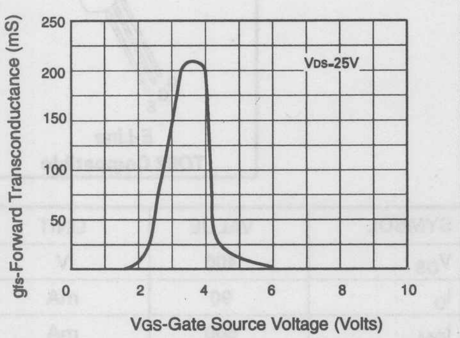
Capacitance v drain-source voltage



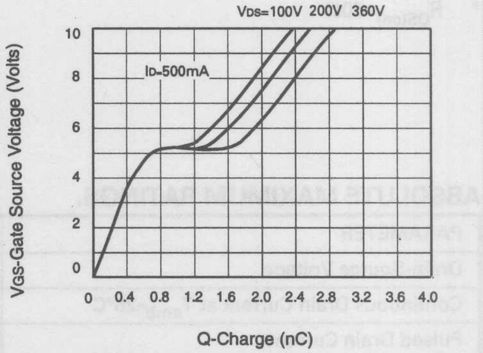
Transconductance v drain current

ZVN0535A

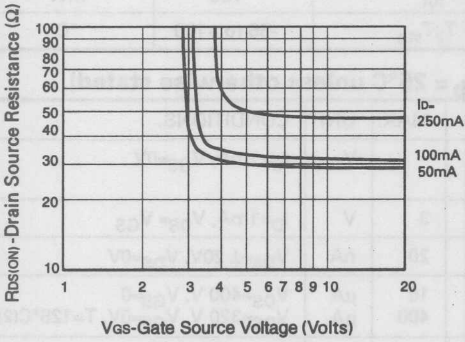
TYPICAL CHARACTERISTICS



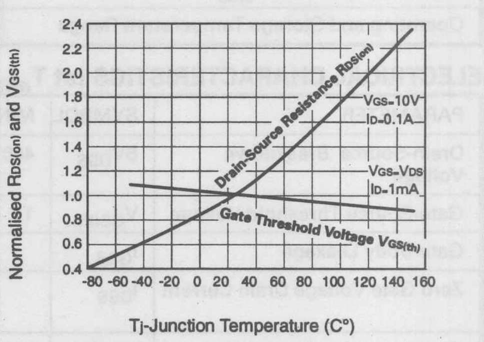
Transconductance v gate-source voltage



Gate charge v gate-source voltage



On-resistance vs gate-source voltage



Normalised RDS(on) and VGS(th) vs Temperature

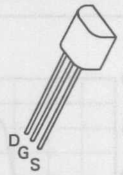
N-CHANNEL ENHANCEMENT MODE VERTICAL DMOS FET

ZVN0540A

ISSUE 2 – MARCH 94

FEATURES

- * 400 Volt V_{DS}
- * $R_{DS(on)}$=50Ω



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Drain-Source Voltage	V_{DS}	400	V
Continuous Drain Current at T_{amb}=25°C	I_D	90	mA
Pulsed Drain Current	I_{DM}	600	mA
Gate-Source Voltage	V_{GS}	± 20	V
Power Dissipation at T_{amb}=25°C	P_{tot}	700	mW
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +150	°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

PARAMETER	SYMBOL	MIN.	MAX.	UNIT	CONDITIONS.
Drain-Source Breakdown Voltage	BV_{DSS}	400		V	I_D=1mA, V_{GS}=0V
Gate-Source Threshold Voltage	$V_{GS(th)}$	1	3	V	I_D=1mA, V_{DS}= V_{GS}
Gate-Body Leakage	I_{GSS}		20	nA	V_{GS}=± 20V, V_{DS}=0V
Zero Gate Voltage Drain Current	I_{DSS}		10 400	µA µA	V_{DS}=400 V, V_{GS}=0 V_{DS}=320 V, V_{GS}=0V, T=125°C(2)
On-State Drain Current(1)	$I_{D(on)}$	150		mA	V_{DS}=25 V, V_{GS}=10V
Static Drain-Source On-State Resistance (1)	$R_{DS(on)}$		50	Ω	V_{GS}=10V,I_D=100mA
Forward Transconductance(1)(2)	g_{fs}	100		mS	V_{DS}=25V,I_D=100mA
Input Capacitance (2)	C_{iss}		70	pF	V_{DS}=25 V, V_{GS}=0V, f=1MHz
Common Source Output Capacitance (2)	C_{oss}		10	pF	
Reverse Transfer Capacitance (2)	C_{rss}		4	pF	
Turn-On Delay Time (2)(3)	$t_{d(on)}$		7	ns	V_{DD}≈25V, I_D=100mA
Rise Time (2)(3)	t_r		7	ns	
Turn-Off Delay Time (2)(3)	$t_{d(off)}$		16	ns	
Fall Time (2)(3)	t_f		10	ns	

(1) Measured under pulsed conditions. Width=300µs. Duty cycle ≤2%
(2) Sample test.
(3) Switching times measured with 50Ω source impedance and <5ns rise time on a pulse generator

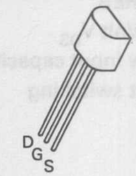
N-CHANNEL ENHANCEMENT MODE VERTICAL DMOS FET

ZVN0545A

ISSUE 2 – MARCH 94

FEATURES

- * 450 Volts V_{DS}
- * $R_{DS(on)} = 50\Omega$



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Drain-Source Voltage	V_{DS}	450	V
Continuous Drain Current at T_{amb}=25°C	I_D	90	mA
Pulsed Drain Current	I_{DM}	600	mA
Gate-Source Voltage	V_{GS}	± 20	V
Power Dissipation at T_{amb}=25°C	P_{tot}	700	mW
Operating and Storage Temperature Range	$T_j{:}T_{stg}$	-55 to +150	°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

PARAMETER	SYMBOL	MIN.	MAX.	UNIT	CONDITIONS.
Drain-Source Breakdown Voltage	BV_{DSS}	450		V	I_D=1mA, V_{GS}=0V
Gate-Source Threshold Voltage	$V_{GS(th)}$	1	3	V	I_D=1mA, V_{DS}= V_{GS}
Gate-Body Leakage	I_{GSS}		20	nA	V_{GS}=± 20V, V_{DS}=0V
Zero Gate Voltage Drain Current	I_{DSS}		10 400	µA µA	V_{DS}=450 V, V_{GS}=0 V_{DS}=405 V, V_{GS}=0V, T=125°C(2)
On-State Drain Current(1)	$I_{D(on)}$	150		mA	V_{DS}=25 V, V_{GS}=10V
Static Drain-Source On-State Resistance (1)	$R_{DS(on)}$		50	Ω	V_{GS}=10V,I_D=100mA
Forward Transconductance(1)(2)	g_{fs}	100		mS	V_{DS}=25V,I_D=100mA
Input Capacitance (2)	C_{iss}		70	pF	V_{DS}=25 V, V_{GS}=0V, f=1MHz
Common Source Output Capacitance (2)	C_{oss}		10	pF	
Reverse Transfer Capacitance (2)	C_{rss}		4	pF	
Turn-On Delay Time (2)(3)	$t_{d(on)}$		7	ns	V_{DD}≈25V, I_D=100mA
Rise Time (2)(3)	t_r		7	ns	
Turn-Off Delay Time (2)(3)	$t_{d(off)}$		16	ns	
Fall Time (2)(3)	t_f		10	ns	

(1) Measured under pulsed conditions. Width=300µs. Duty cycle ≤2%
(2) Sample test.
(3) Switching times measured with 50Ω source impedance and <5ns rise time on a pulse generator

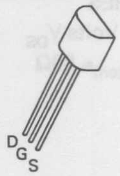
N-CHANNEL ENHANCEMENT MODE VERTICAL DMOS FET

ZVN1409A

ISSUE 2 – MARCH 94

FEATURES

- 90 Volt V_{DS}
- Low input capacitance
- Fast switching



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

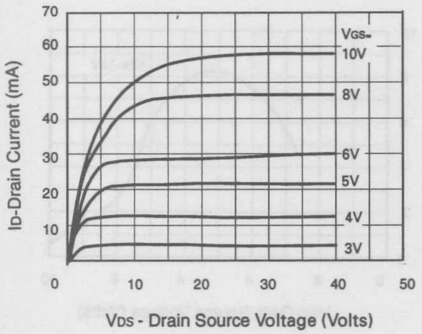
PARAMETER	SYMBOL	VALUE	UNIT
Drain-Source Voltage	V_{DS}	90	V
Continuous Drain Current	I_D	10	mA
Pulsed Drain Current	I_{DM}	40	mA
Gate Source Voltage	V_{GS}	± 20	V
Power Dissipation at T_{amb}=25°C	P_{tot}	625	mW
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +150	°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

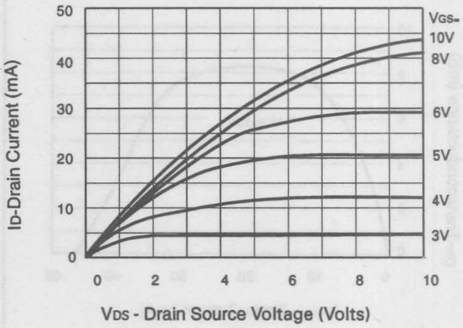
PARAMETER	SYMBOL	MIN.	MAX.	UNIT	CONDITIONS.
Drain-Source Breakdown Voltage	BV_{DSS}	90		V	I_D=0.1mA, V_{GS}=0V
Gate-Source Breakdown Voltage	$V_{GS(th)}$	0.8	2.4	V	I_D=0.1mA, V_{DS}= V_{GS}
Gate Body Leakage	I_{GSS}		100	nA	V_{GS}=± 20V, V_{DS}=0V
Zero Gate Voltage Drain Current	I_{DSS}		1 100 (2)	µA µA	V_{DS}=90V, V_{GS}=0V V_{DS}=72V, V_{GS}=0V, T=125°C
On State Drain Current (1)	$I_{D(on)}$	10		mA	V_{DS}=25 V, V_{GS}=10V
Static Drain Source On State Resistance (1)	$R_{DS(on)}$		250	Ω	V_{GS}=10V,I_D=5mA
Forward Transconductance (1)(2)	g_{fs}	2		mS	V_{DS}=25V,I_D=10mA
Input Capacitance (2)	C_{iss}		6.5	pF	V_{DS}=25 V, V_{GS}=0V f=1MHz
Common Source Output Capacitance (2)	C_{oss}		3	pF	
Reverse Transfer Capacitance (2)	C_{rss}		0.65	pF	
Turn-On Delay Time (2)(3)(4)	$t_{d(on)}$		0.3	ns	V_{DD}≈25V, I_D=5mA
Rise Time (2)(3)(4)	t_r		0.5	ns	
Turn-Off Delay Time (2)(3)(4)	$t_{d(off)}$		0.35	ns	
Fall Time (2)(3)(4)	t_f		0.5	ns	

(1) Measured under pulsed conditions. Width=300µs. Duty cycle ≤2%
(2) Sample test.
(3) Switching times measured with 50Ω source impedance and <5ns rise time on a pulse generator
(4) Typical Values

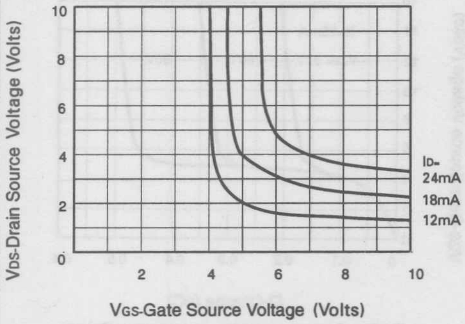
TYPICAL CHARACTERISTICS



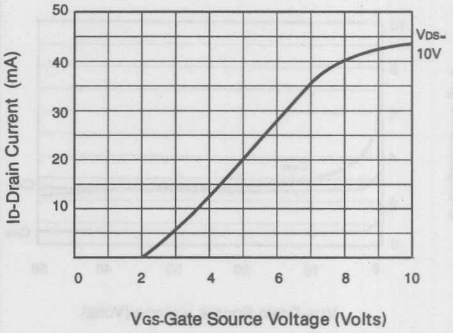
Output Characteristics



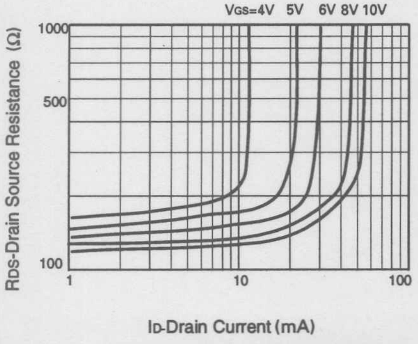
Saturation Characteristics



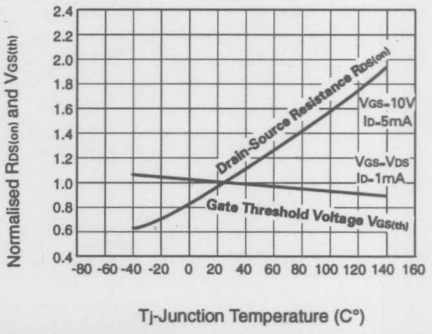
Voltage Saturation Characteristics



Transfer Characteristics

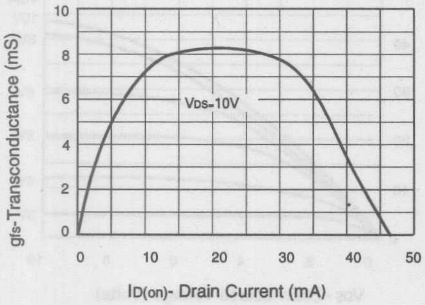


On-resistance v drain current

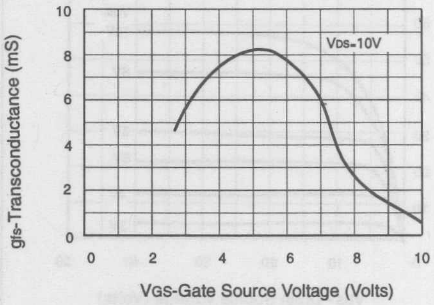


Normalised RDS(on) and VGS(th) vs Temperature

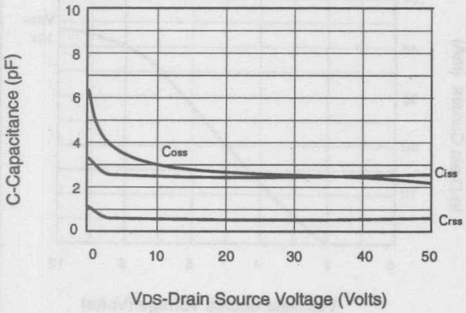
TYPICAL CHARACTERISTICS



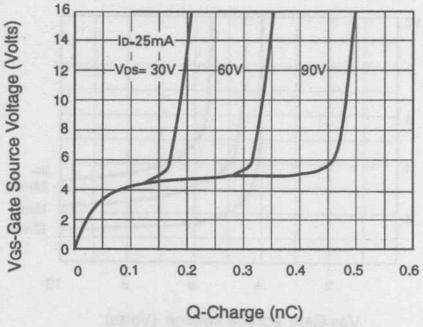
Transconductance v drain current



Transconductance v gate-source voltage



Capacitance v drain-source voltage



Gate charge v gate-source voltage

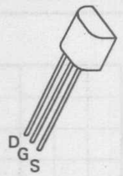
N-CHANNEL ENHANCEMENT MODE VERTICAL DMOS FET

ISSUE 2 – MARCH 94

ZVN2106A

FEATURES

- * 60 Volt V_{DS}
- * $R_{DS(on)}=2\Omega$



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Drain-Source Voltage	V_{DS}	60	V
Continuous Drain Current at $T_{amb}=25°C$	I_D	450	mA
Pulsed Drain Current	I_{DM}	8	A
Gate Source Voltage	V_{GS}	± 20	V
Power Dissipation at $T_{amb}=25°C$	P_{tot}	700	mW
Operating and Storage Temperature Range	$T_j{:}T_{stg}$	-55 to +150	°C

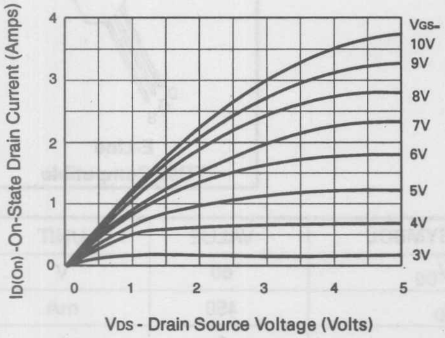
ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

PARAMETER	SYMBOL	MIN.	MAX.	UNIT	CONDITIONS.
Drain-Source Breakdown Voltage	BV_{DSS}	60		V	I_D=1mA, V_{GS}=0V
Gate-Source Threshold Voltage	$V_{GS(th)}$	0.8	2.4	V	I_D=1mA, V_{DS}= V_{GS}
Gate-Body Leakage	I_{GSS}		20	nA	V_{GS}=± 20V, V_{DS}=0V
Zero Gate Voltage Drain Current	I_{DSS}		500 100	nA µA	V_{DS}=60 V, V_{GS}=0 V_{DS}=48 V, V_{GS}=0V, T=125°C(2)
On-State Drain Current(1)	$I_{D(on)}$	2		A	V_{DS}=18V, V_{GS}=10V
Static Drain-Source On-State Resistance (1)	$R_{DS(on)}$		2	Ω	V_{GS}=10V,I_D=1A
Forward Transconductance (1)(2)	g_{fs}	300		mS	V_{DS}=18V,I_D=1A
Input Capacitance (2)	C_{iss}		75	pF	V_{DS}=18 V, V_{GS}=0V, f=1MHz
Common Source Output Capacitance (2)	C_{oss}		45	pF	
Reverse Transfer Capacitance (2)	C_{rss}		20	pF	
Turn-On Delay Time (2)(3)	$t_{d(on)}$		7	ns	$V_{DD}\approx$18V, I_D=1A
Rise Time (2)(3)	t_r		8	ns	
Turn-Off Delay Time (2)(3)	$t_{d(off)}$		12	ns	
Fall Time (2)(3)	t_f		15	ns	

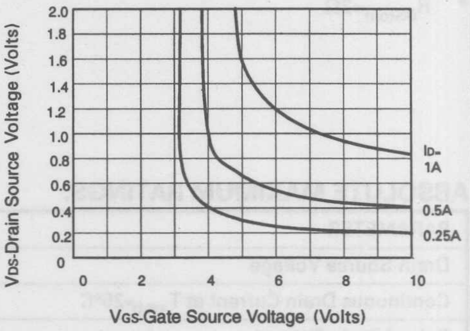
(1) Measured under pulsed conditions. Width=300µs. Duty cycle ≤2%
(2) Sample test.
(3) Switching times measured with 50Ω source impedance and <5ns rise time on a pulse generator

ZVN2106A

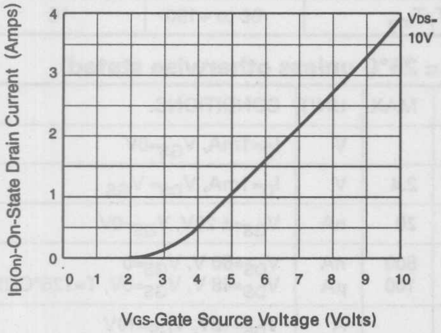
TYPICAL CHARACTERISTICS



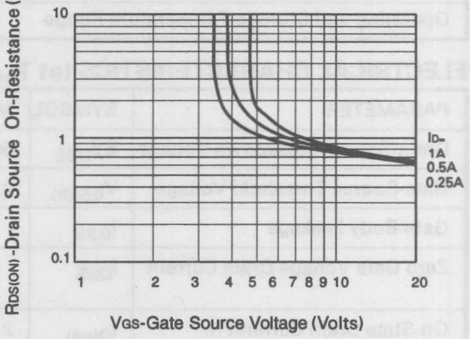
Saturation Characteristics



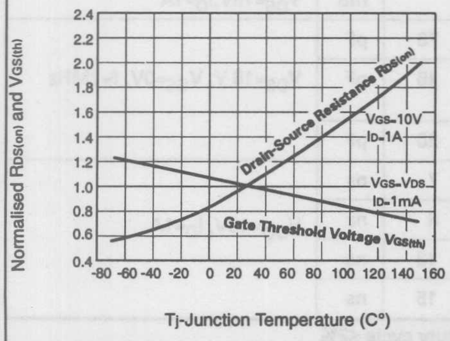
Voltage Saturation Characteristics



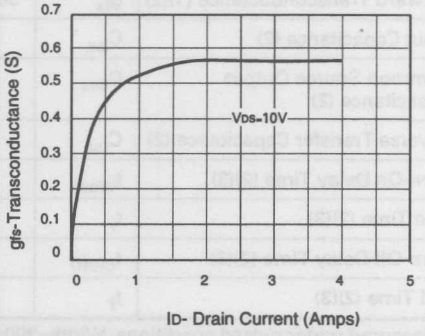
Transfer Characteristics



On-resistance v gate-source voltage



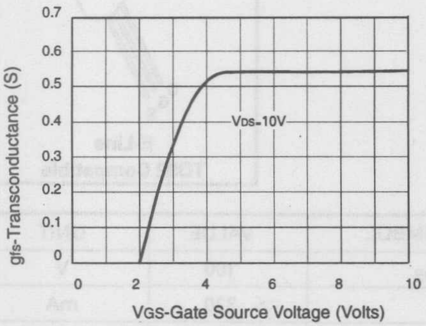
Normalised RDS(on) and VGS(th) vs Temperature



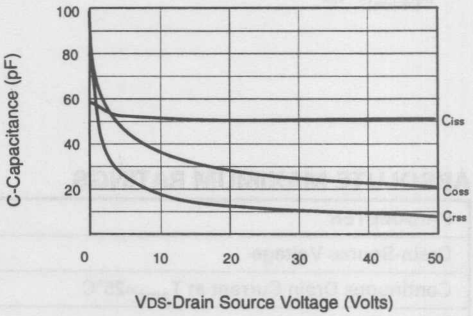
Transconductance v drain current

ZVN2106A

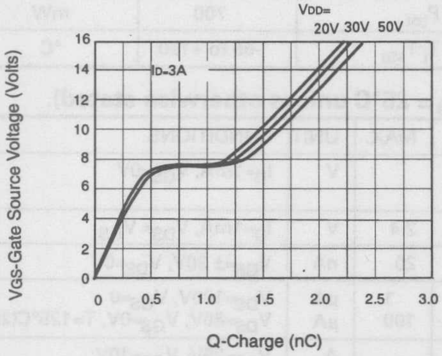
TYPICAL CHARACTERISTICS



Transconductance v gate-source voltage



Capacitance v drain-source voltage



Gate charge v gate-source voltage

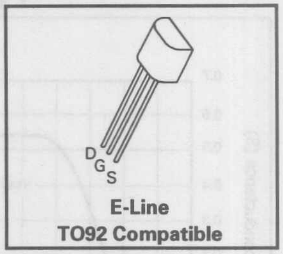
N-CHANNEL ENHANCEMENT MODE VERTICAL DMOS FET

ZVN2110A

ISSUE 2 – MARCH 94

FEATURES

- 100 Volt V_{DS}
- $R_{DS(on)}= 4\Omega$



ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Drain-Source Voltage	V_{DS}	100	V
Continuous Drain Current at T_{amb}=25°C	I_D	320	mA
Pulsed Drain Current	I_{DM}	6	A
Gate Source Voltage	V_{GS}	± 20	V
Power Dissipation at T_{amb}=25°C	P_{tot}	700	mW
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +150	°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

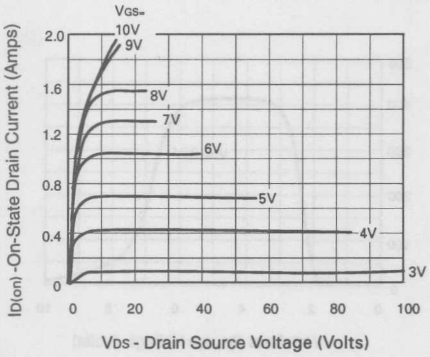
PARAMETER	SYMBOL	MIN.	MAX.	UNIT	CONDITIONS.
Drain-Source Breakdown Voltage	BV_{DSS}	100		V	I_D=1mA, V_{GS}=0V
Gate-Source Threshold Voltage	$V_{GS(th)}$	0.8	2.4	V	I_D=1mA, V_{DS}= V_{GS}
Gate-Body Leakage	I_{GSS}		20	nA	V_{GS}=± 20V, V_{DS}=0V
Zero Gate Voltage Drain Current	I_{DSS}		1 100	µA µA	V_{DS}=100V, V_{GS}=0 V_{DS}=80V, V_{GS}=0V, T=125°C(2)
On-State Drain Current(1)	$I_{D(on)}$	1.5		A	V_{DS}=25V, V_{GS}=10V
Static Drain-Source On-State Resistance (1)	$R_{DS(on)}$		4	Ω	V_{GS}=10V,I_D=1A
Forward Transconductance (1)(2)	g_{fs}	250		mS	V_{DS}=25V,I_D=1A
Input Capacitance (2)	C_{iss}		75	pF	V_{DS}=25 V, V_{GS}=0V, f=1MHz
Common Source Output Capacitance (2)	C_{oss}		25	pF	
Reverse Transfer Capacitance (2)	C_{rss}		8	pF	
Turn-On Delay Time (2)(3)	$t_{d(on)}$		7	ns	V_{DD}≈25V, I_D=1A
Rise Time (2)(3)	t_r		8	ns	
Turn-Off Delay Time (2)(3)	$t_{d(off)}$		13	ns	
Fall Time (2)(3)	t_f		13	ns	

(1) Measured under pulsed conditions. Width=300µs. Duty cycle ≤2%

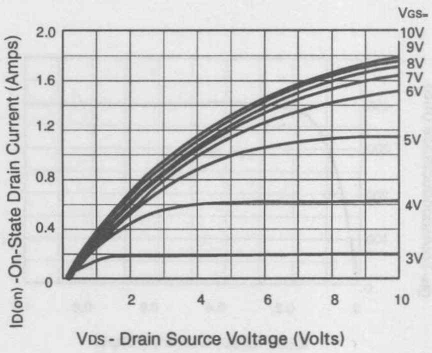
(2) Sample test.

(3) Switching times measured with 50Ω source impedance and <5ns rise time on a pulse generator

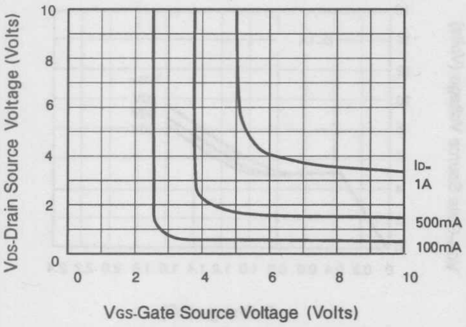
TYPICAL CHARACTERISTICS



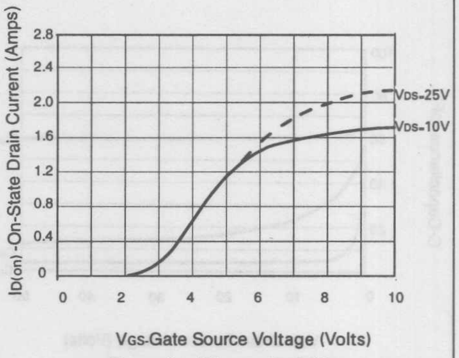
Output Characteristics



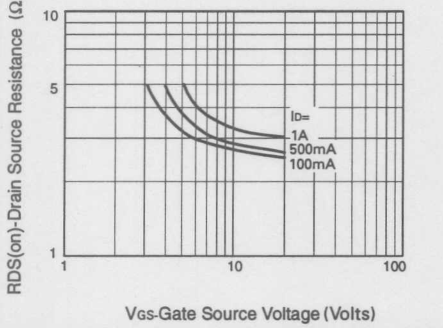
Saturation Characteristics



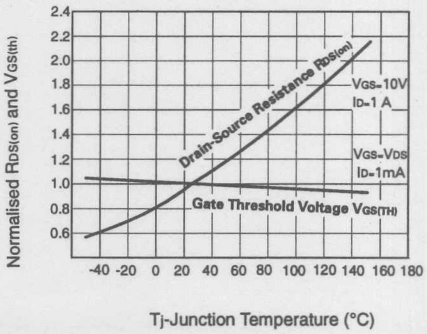
Voltage Saturation Characteristics



Transfer Characteristics

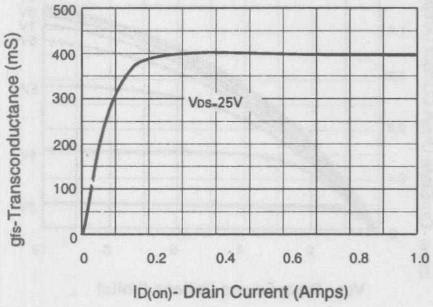


On-resistance v gate-source voltage

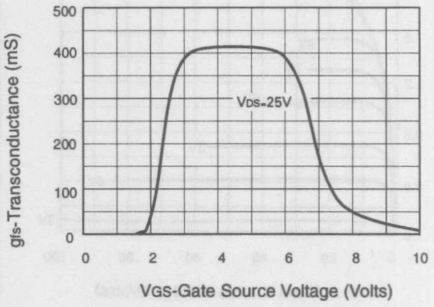


Normalised RDS(on) and VGS(th) v Temperature

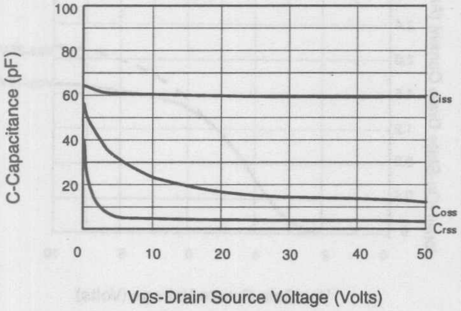
TYPICAL CHARACTERISTICS



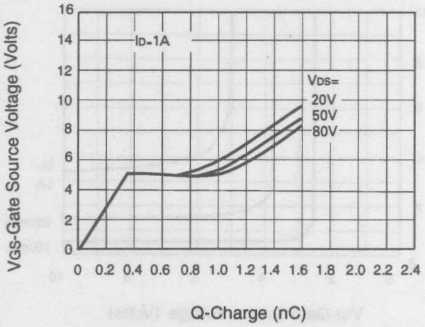
Transconductance v drain current



Transconductance v gate-source voltage



Capacitance v drain-source voltage



Gate charge v gate-source voltage

N-CHANNEL ENHANCEMENT MODE VERTICAL DMOS FET

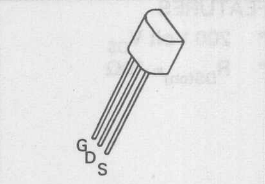
ZVN2110C

ISSUE 2 – MARCH 94

FEATURES

- 100 Volt V_{DS}
- $R_{DS(on)} = 4\Omega$

REFER TO ZVN2110A FOR GRAPHS



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Drain-Source Voltage	V_{DS}	100	V
Continuous Drain Current at T_{amb}=25°C	I_D	320	mA
Pulsed Drain Current	I_{DM}	6	A
Gate Source Voltage	V_{GS}	± 20	V
Power Dissipation at T_{amb}=25°C	P_{tot}	700	mW
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +150	°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

PARAMETER	SYMBOL	MIN.	MAX.	UNIT	CONDITIONS.
Drain-Source Breakdown Voltage	BV_{DSS}	100		V	I_D=1mA, V_{GS}=0V
Gate-Source Threshold Voltage	$V_{GS(th)}$	0.8	2.4	V	I_D=1mA, V_{DS}= V_{GS}
Gate-Body Leakage	I_{GSS}		20	nA	V_{GS}=± 20V, V_{DS}=0V
Zero Gate Voltage Drain Current	I_{DSS}		1 100	µA µA	V_{DS}=100V, V_{GS}=0 V_{DS}=80V, V_{GS}=0V, T=125°C(2)
On-State Drain Current(1)	$I_{D(on)}$	1.5		A	V_{DS}=25V, V_{GS}=10V
Static Drain-Source On-State Resistance (1)	$R_{DS(on)}$		4	Ω	V_{GS}=10V,I_D=1A
Forward Transconductance (1)(2)	g_{fs}	250		mS	V_{DS}=25V,I_D=1A
Input Capacitance (2)	C_{iss}		75	pF	V_{DS}=25 V, V_{GS}=0V, f=1MHz
Common Source Output Capacitance (2)	C_{oss}		25	pF	
Reverse Transfer Capacitance (2)	C_{rss}		8	pF	
Turn-On Delay Time (2)(3)	$t_{d(on)}$		7	ns	V_{DD}≈25V, I_D=1A
Rise Time (2)(3)	t_r		8	ns	
Turn-Off Delay Time (2)(3)	$t_{d(off)}$		13	ns	
Fall Time (2)(3)	t_f		13	ns	

(1) Measured under pulsed conditions. Width=300µs. Duty cycle ≤2%
(2) Sample test.
(3) Switching times measured with 50Ω source impedance and <5ns rise time on a pulse generator

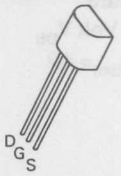
N-CHANNEL ENHANCEMENT MODE VERTICAL DMOS FET

ZVN2120A

ISSUE 2 – MARCH 94

FEATURES

- * 200 Volt V_{DS}
- * $R_{DS(on)} = 10\Omega$



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

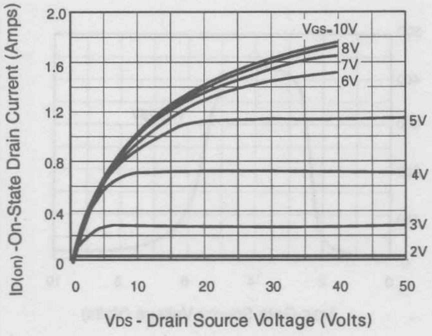
PARAMETER	SYMBOL	VALUE	UNIT
Drain-Source Voltage	V_{DS}	200	V
Continuous Drain Current at T_{amb}=25°C	I_D	180	mA
Pulsed Drain Current	I_{DM}	2	A
Gate Source Voltage	V_{GS}	± 20	V
Power Dissipation at T_{amb}=25°C	P_{tot}	700	mW
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +150	°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

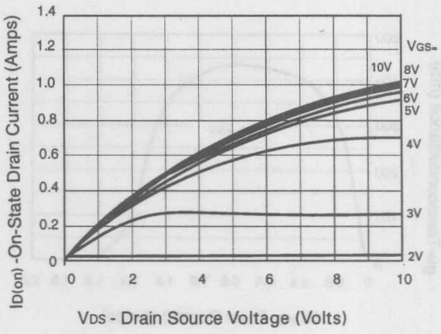
PARAMETER	SYMBOL	MIN.	MAX.	UNIT	CONDITIONS.
Drain-Source Breakdown Voltage	BV_{DSS}	200		V	I_D=1mA, V_{GS}=0V
Gate-Source Threshold Voltage	$V_{GS(th)}$	1	3	V	I_D=1mA, V_{DS}= V_{GS}
Gate-Body Leakage	I_{GSS}		20	nA	V_{GS}=± 20V, V_{DS}=0V
Zero Gate Voltage Drain Current	I_{DSS}		10 100	µA µA	V_{DS}=200V, V_{GS}=0 V_{DS}=160V, V_{GS}=0V, T=125°C(2)
On-State Drain Current(1)	$I_{D(on)}$	500		mA	V_{DS}=25V, V_{GS}=10V
Static Drain-Source On-State Resistance (1)	$R_{DS(on)}$		10	Ω	V_{GS}=10V,I_D=250mA
Forward Transconductance (1)(2)	g_{fs}	100		mS	V_{DS}=25V,I_D=250mA
Input Capacitance (2)	C_{iss}		85	pF	V_{DS}=25 V, V_{GS}=0V, f=1MHz
Common Source Output Capacitance (2)	C_{oss}		20	pF	
Reverse Transfer Capacitance (2)	C_{rss}		7	pF	
Turn-On Delay Time (2)(3)	$t_{d(on)}$		8	ns	V_{DD}≈25V, I_D=250mA
Rise Time (2)(3)	t_r		8	ns	
Turn-Off Delay Time (2)(3)	$t_{d(off)}$		20	ns	
Fall Time (2)(3)	t_f		12	ns	

(1) Measured under pulsed conditions. Width=300µs. Duty cycle ≤2%
(2) Sample test.
(3) Switching times measured with 50Ω source impedance and <5ns rise time on a pulse generator

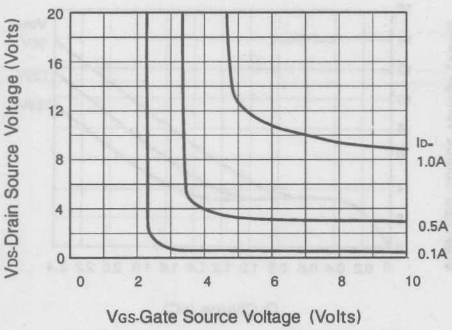
TYPICAL CHARACTERISTICS



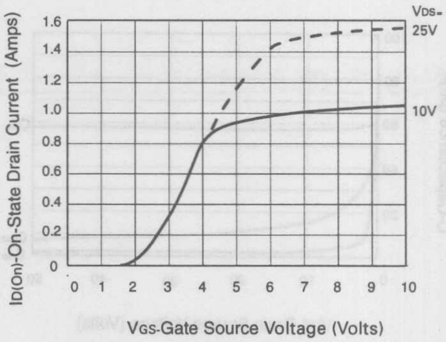
Output Characteristics



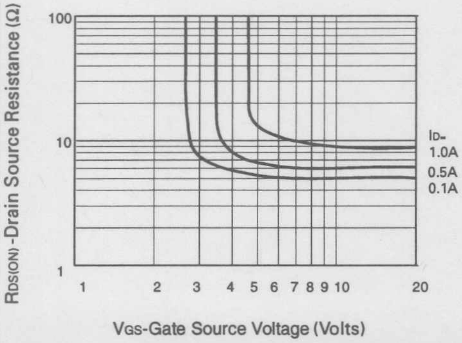
Saturation Characteristics



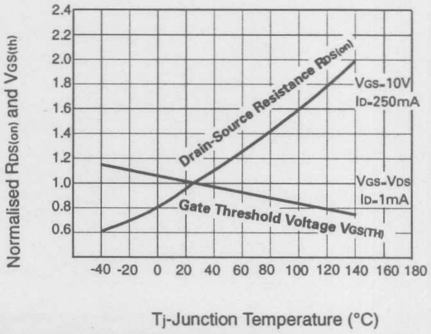
Voltage Saturation Characteristics



Transfer Characteristics



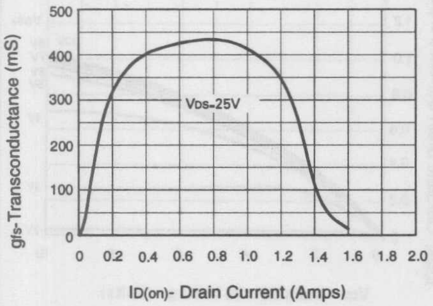
On-resistance vs gate-source voltage



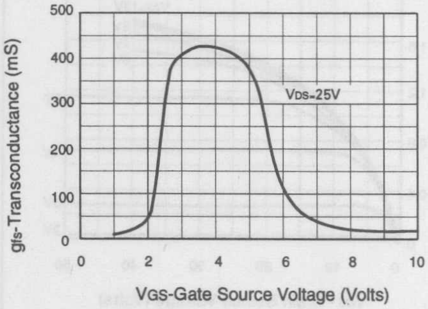
Normalised RDS(on) and VGS(th) v Temperature

ZVN2120A

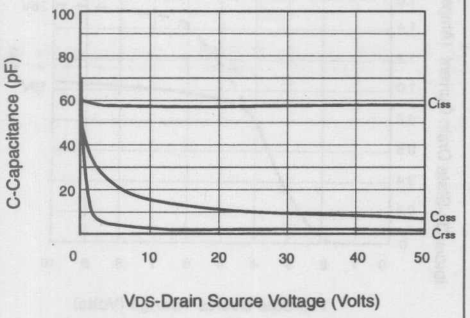
TYPICAL CHARACTERISTICS



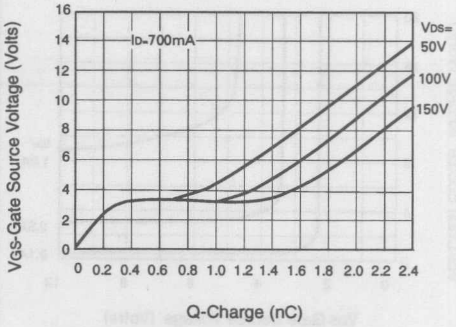
Transconductance v drain current



Transconductance v gate-source voltage



Capacitance v drain-source voltage



Gate charge v gate-source voltage

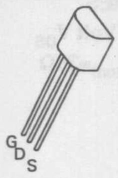
N-CHANNEL ENHANCEMENT MODE VERTICAL DMOS FET

ZVN2120C

ISSUE 2 – MARCH 94

FEATURES

- * 200 Volt V_{DS}
- * $R_{DS(on)}=10\Omega$



E-Line
TO92 Compatible

REFER TO ZVN2120A FOR GRAPHS

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Drain-Source Voltage	V_{DS}	200	V
Continuous Drain Current at T_{amb}=25°C	I_D	180	mA
Pulsed Drain Current	I_{DM}	2	A
Gate Source Voltage	V_{GS}	± 20	V
Power Dissipation at T_{amb}=25°C	P_{tot}	700	mW
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +150	°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

PARAMETER	SYMBOL	MIN.	MAX.	UNIT	CONDITIONS.
Drain-Source Breakdown Voltage	BV_{DSS}	200		V	I_D=1mA, V_{GS}=0V
Gate-Source Threshold Voltage	$V_{GS(th)}$	1	3	V	I_D=1mA, V_{DS}= V_{GS}
Gate-Body Leakage	I_{GSS}		20	nA	V_{GS}=± 20V, V_{DS}=0V
Zero Gate Voltage Drain Current	I_{DSS}		10 100	µA µA	V_{DS}=200V, V_{GS}=0 V_{DS}=160V, V_{GS}=0V, T=125°C(2)
On-State Drain Current(1)	$I_{D(on)}$	500		mA	V_{DS}=25V, V_{GS}=10V
Static Drain-Source On-State Resistance (1)	$R_{DS(on)}$		10	Ω	V_{GS}=10V,I_D=250mA
Forward Transconductance (1)(2)	g_{fs}	100		mS	V_{DS}=25V,I_D=250mA
Input Capacitance (2)	C_{iss}		85	pF	V_{DS}=25 V, V_{GS}=0V, f=1MHz
Common Source Output Capacitance (2)	C_{oss}		20	pF	
Reverse Transfer Capacitance (2)	C_{rss}		7	pF	
Turn-On Delay Time (2)(3)	$t_{d(on)}$		8	ns	V_{DD}≈25V, I_D=250mA
Rise Time (2)(3)	t_r		8	ns	
Turn-Off Delay Time (2)(3)	$t_{d(off)}$		20	ns	
Fall Time (2)(3)	t_f		12	ns	

(1) Measured under pulsed conditions. Width=300µs. Duty cycle ≤2%
(2) Sample test.
(3) Switching times measured with 50Ω source impedance and <5ns rise time on a pulse generator

N-CHANNEL ENHANCEMENT MODE VERTICAL DMOS FET

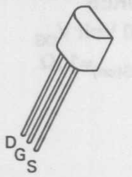
ZVN2535A

ISSUE 2 – MARCH 94

FEATURES

* 350 Volt V_{DS}

$R_{DS(on)}$=35Ω



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

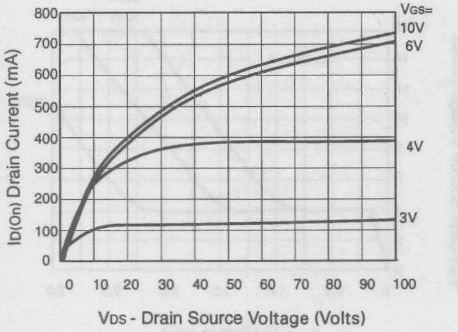
PARAMETER	SYMBOL	VALUE	UNIT
Drain-Source Voltage	V_{DS}	350	V
Continuous Drain Current at T_{amb}=25°C	I_D	90	mA
Pulsed Drain Current	I_{DM}	1	A
Gate Source Voltage	V_{GS}	± 20	V
Power Dissipation at T_{amb}=25°C	P_{tot}	700	mW
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +150	°C

ELECTRICAL CHARACTERISTICS (at T_{amb}= 25°C unless otherwise stated).

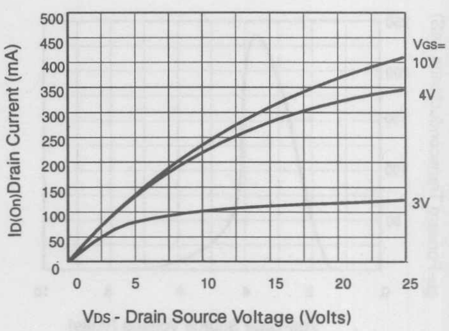
PARAMETER	SYMBOL	MIN.	MAX.	UNIT	CONDITIONS.
Drain-Source Breakdown Voltage	BV_{DSS}	350		V	I_D=1mA, V_{GS}=0V
Gate-Source Threshold Voltage	$V_{GS(th)}$	1	3	V	I_D=1mA, V_{DS}= V_{GS}
Gate-Body Leakage	I_{GSS}		20	nA	V_{GS}=± 20V, V_{DS}=0V
Zero Gate Voltage Drain Current	I_{DSS}		10 400	µA µA	V_{DS}=350V, V_{GS}=0 V_{DS}=280V, V_{GS}=0V, T=125°C(2)
On-State Drain Current(1)	$I_{D(on)}$	250		mA	V_{DS}=25V, V_{GS}=10V
Static Drain-Source On-State Resistance (1)	$R_{DS(on)}$		35	Ω	V_{GS}=10V,I_D=100mA
Forward Transconductance (1)(2)	g_{fs}	100		mS	V_{DS}=25V,I_D=100mA
Input Capacitance (2)	C_{iss}		70	pF	V_{DS}=25 V, V_{GS}=0V, f=1MHz
Common Source Output Capacitance (2)	C_{oss}		10	pF	
Reverse Transfer Capacitance (2)	C_{rss}		4	pF	
Turn-On Delay Time (2)(3)	$t_{d(on)}$		7	ns	V_{DD} ≈25V, I_D=100mA
Rise Time (2)(3)	t_r		7	ns	
Turn-Off Delay Time (2)(3)	$t_{d(off)}$		16	ns	
Fall Time (2)(3)	t_f		10	ns	

(1) Measured under pulsed conditions. Width=300µs. Duty cycle ≤2%
(2) Sample test.
(3) Switching times measured with 50Ω source impedance and <5ns rise time on a pulse generator

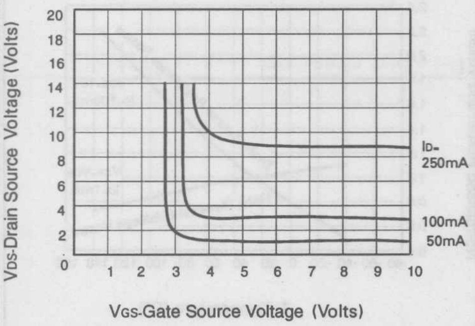
TYPICAL CHARACTERISTICS



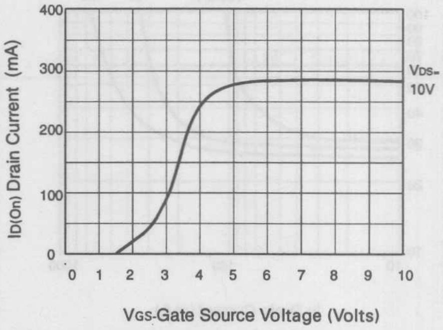
Output Characteristics



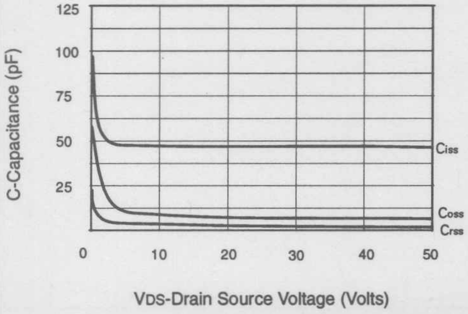
Saturation Characteristics



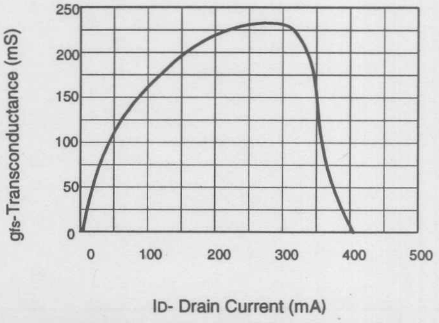
Voltage Saturation Characteristics



Transfer Characteristics

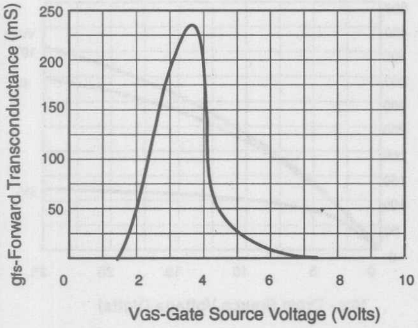


Capacitance v drain-source voltage

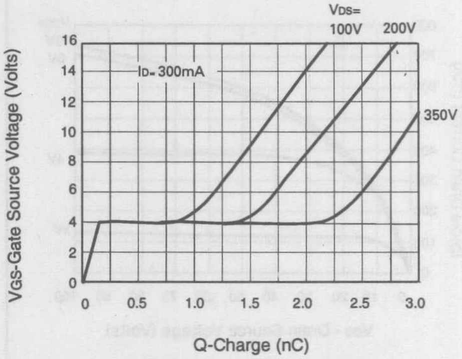


Transconductance v drain current

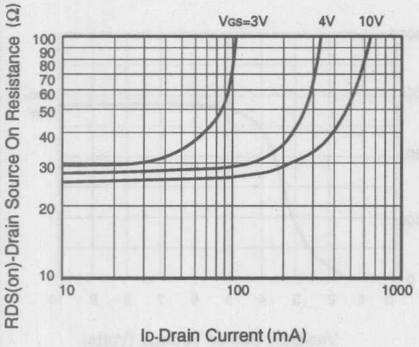
TYPICAL CHARACTERISTICS



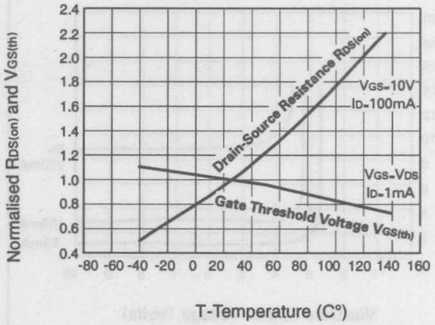
Transconductance v gate-source voltage



Gate charge v gate-source voltage



On-resistance v drain current



Normalised $R_{DS(on)}$ and $V_{GS(th)}$ vs Temperature

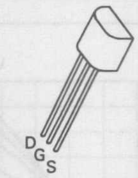
N-CHANNEL ENHANCEMENT MODE VERTICAL DMOS FET

ZVN3306A

ISSUE 2 – MARCH 94

FEATURES

- 60 Volt V_{DS}
- $R_{DSon)}=5\Omega$



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Drain-Source Voltage	V_{DS}	60	V
Continuous Drain Current at T_{amb}=25°C	I_D	270	mA
Pulsed Drain Current	I_{DM}	3	A
Gate-Source Voltage	V_{GS}	± 20	V
Power Dissipation at T_{amb}=25°C	P_{tot}	625	mW
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +150	°C

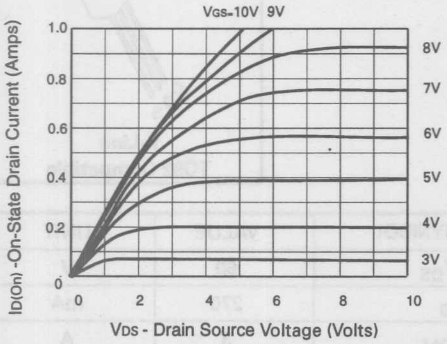
ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

PARAMETER	SYMBOL	MIN.	MAX.	UNIT	CONDITIONS.
Drain-Source Breakdown Voltage	BV_{DSS}	60		V	I_D=1mA, V_{GS}=0V
Gate-Source Threshold Voltage	$V_{GS(th)}$	0.8	2.4	V	I_D=1mA, V_{DS}= V_{GS}
Gate-Body Leakage	I_{GSS}		20	nA	V_{GS}=± 20V, V_{DS}=0V
Zero Gate Voltage Drain Current	I_{DSS}		0.5 50	µA µA	V_{DS}=60V, V_{GS}=0 V_{DS}=48V, V_{GS}=0V, T=125°C(2)
On-State Drain Current(1)	$I_{D(on)}$	750		mA	V_{DS}=18V, V_{GS}=10V
Static Drain-Source On-State Resistance (1)	$R_{DS(on)}$		5	Ω	V_{GS}=10V,I_D=500mA
Forward Transconductance(1)(2)	g_{fs}	150		mS	V_{DS}=18V,I_D=500mA
Input Capacitance (2)	C_{iss}		35	pF	V_{DS}=18V, V_{GS}=0V, f=1MHz
Common Source Output Capacitance (2)	C_{oss}		25	pF	
Reverse Transfer Capacitance (2)	C_{rss}		8	pF	
Turn-On Delay Time (2)(3)	$t_{d(on)}$		5	ns	$V_{DD}\approx$18V, I_D=500mA
Rise Time (2)(3)	t_r		7	ns	
Turn-Off Delay Time (2)(3)	$t_{d(off)}$		6	ns	
Fall Time (2)(3)	t_f		8	ns	

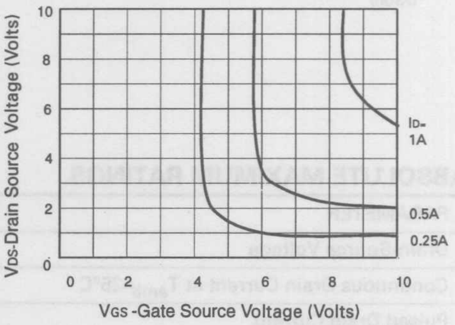
(1) Measured under pulsed conditions. Width=300µs. Duty cycle ≤2%
(2) Sample test.
(3) Switching times measured with 50Ω source impedance and <5ns rise time on a pulse generator

ZVN3306A

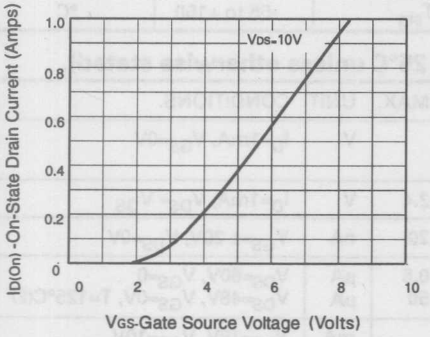
TYPICAL CHARACTERISTICS



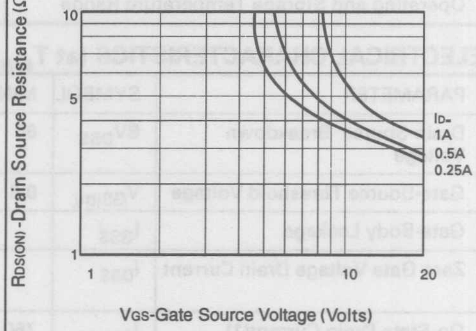
Saturation Characteristics



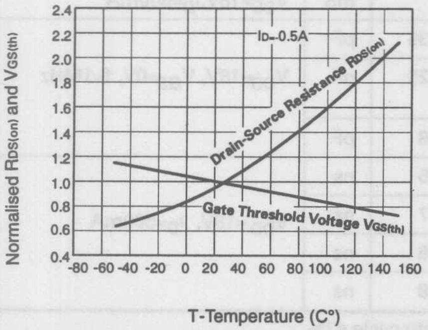
Voltage Saturation Characteristics



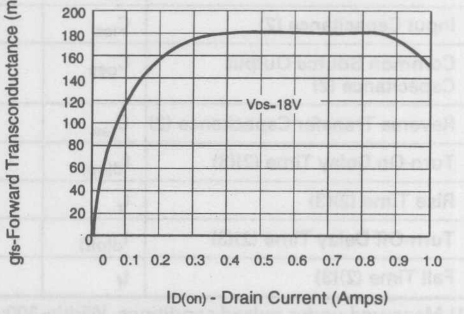
Transfer Characteristics



On-resistance vs gate-source voltage

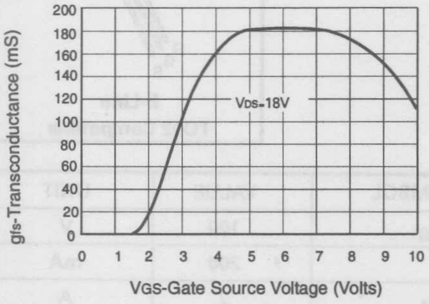


Normalised RDS(on) and VGS(th) vs Temperature

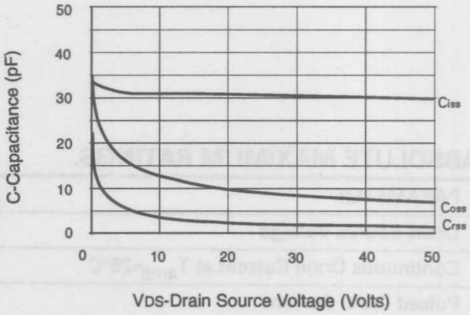


Transconductance v drain current

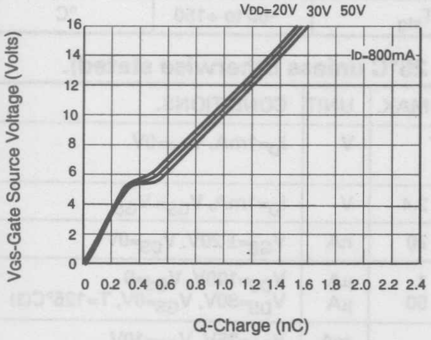
TYPICAL CHARACTERISTICS



Transconductance v gate-source voltage



Capacitance v drain-source voltage



Gate charge v gate-source voltage

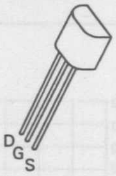
N-CHANNEL ENHANCEMENT MODE VERTICAL DMOS FET

ISSUE 2 – MARCH 94

ZVN3310A

FEATURES

- * 100 Volt V_{DS}
- * $R_{DS(on)}$= 10Ω



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

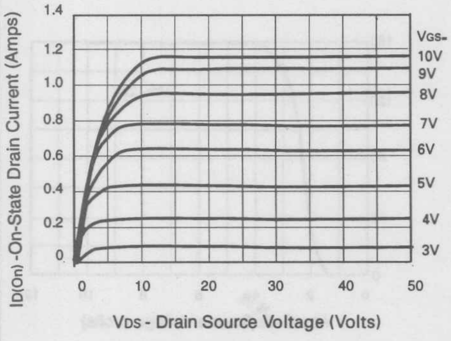
PARAMETER	SYMBOL	VALUE	UNIT
Drain-Source Voltage	V_{DS}	100	V
Continuous Drain Current at T_{amb}=25°C	I_D	200	mA
Pulsed Drain Current	I_{DM}	2	A
Gate-Source Voltage	V_{GS}	± 20	V
Power Dissipation at T_{amb}=25°C	P_{tot}	625	mW
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +150	°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

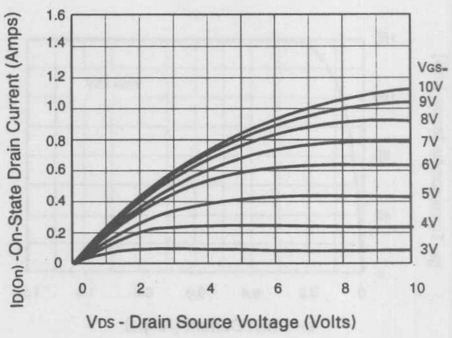
PARAMETER	SYMBOL	MIN.	MAX.	UNIT	CONDITIONS.
Drain-Source Breakdown Voltage	BV_{DSS}	100		V	I_D=1mA, V_{GS}=0V
Gate-Source Threshold Voltage	$V_{GS(th)}$	0.8	2.4	V	I_D=1mA, V_{DS}= V_{GS}
Gate-Body Leakage	I_{GSS}		20	nA	V_{GS}=± 20V, V_{DS}=0V
Zero Gate Voltage Drain Current	I_{DSS}		1 50	µA µA	V_{DS}=100V, V_{GS}=0 V_{DS}=80V, V_{GS}=0V, T=125°C(2)
On-State Drain Current(1)	$I_{D(on)}$	500		mA	V_{DS}=25V, V_{GS}=10V
Static Drain-Source On-State Resistance (1)	$R_{DS(on)}$		10	Ω	V_{GS}=10V,I_D=500mA
Forward Transconductance(1)(2)	g_{fs}	100		mS	V_{DS}=25V,I_D=500mA
Input Capacitance (2)	C_{iss}		40	pF	V_{DS}=25V, V_{GS}=0V, f=1MHz
Common Source Output Capacitance (2)	C_{oss}		15	pF	
Reverse Transfer Capacitance (2)	C_{rss}		5	pF	
Turn-On Delay Time (2)(3)	$t_{d(on)}$		5	ns	V_{DD}≈25V, I_D=500mA
Rise Time (2)(3)	t_r		7	ns	
Turn-Off Delay Time (2)(3)	$t_{d(off)}$		6	ns	
Fall Time (2)(3)	t_f		7	ns	

(1) Measured under pulsed conditions. Width=300µs. Duty cycle ≤2%
(2) Sample test.
(3) Switching times measured with 50Ω source impedance and <5ns rise time on a pulse generator

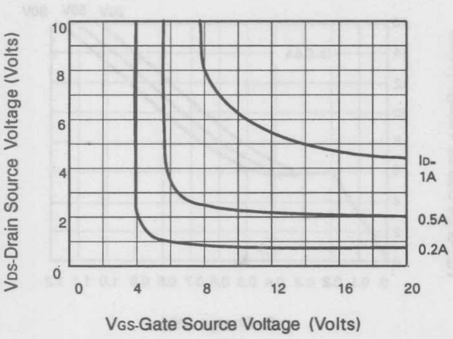
TYPICAL CHARACTERISTICS



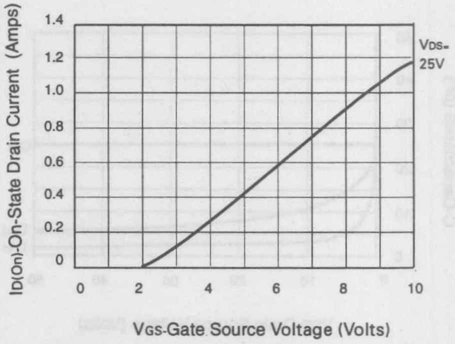
Output Characteristics



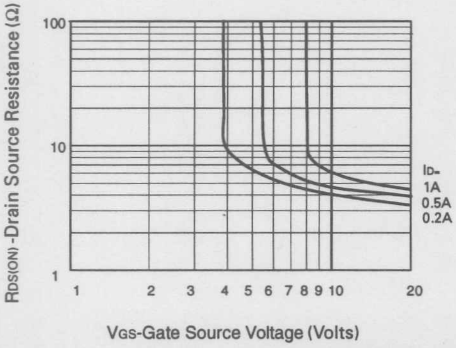
Saturation Characteristics



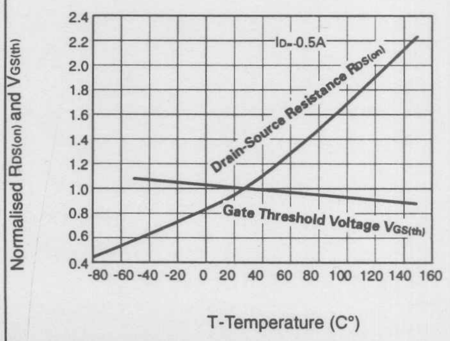
Voltage Saturation Characteristics



Transfer Characteristics

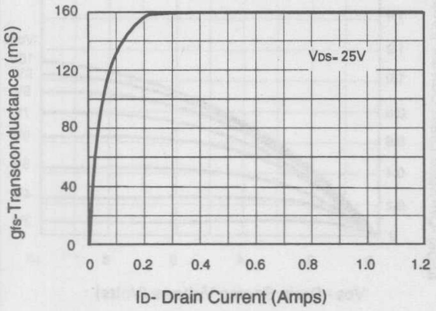


On-resistance vs gate-source voltage

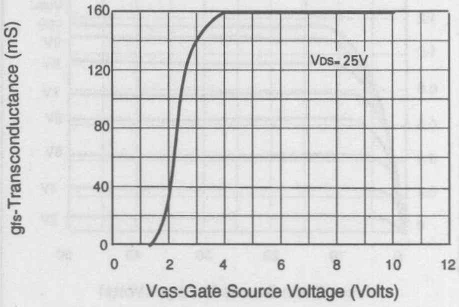


Normalised RDS(on) and VGS(th) vs Temperature

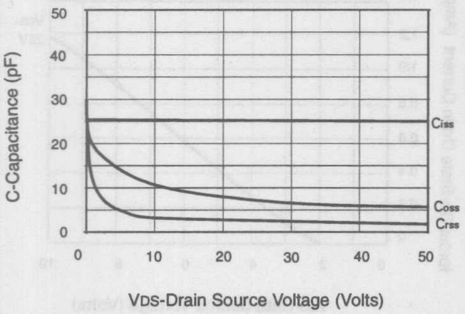
TYPICAL CHARACTERISTICS



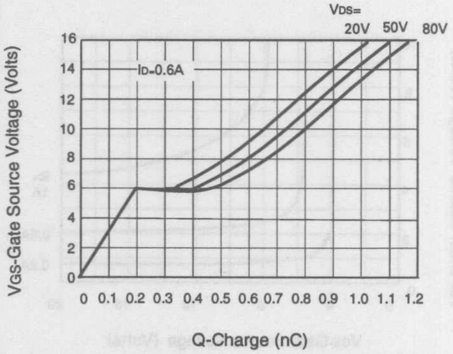
Transconductance v drain current



Transconductance v gate-source voltage



Capacitance v drain-source voltage



Gate charge v gate-source voltage

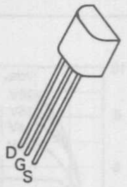
N-CHANNEL ENHANCEMENT MODE VERTICAL DMOS FET

ZVN4206A

ISSUE 2 – JUNE 94

FEATURES

- 60 Volt V_{DS}
- $R_{DS(on)} = 1\ \Omega$



E-LINE
TO92 COMPATIBLE

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Drain-Source Voltage	V_{DS}	60	V
Continuous Drain Current at T_{amb}=25°C	I_D	600	mA
Pulsed Drain Current	I_{DM}	8	A
Gate-Source Voltage	V_{GS}	± 20	V
Power Dissipation at T_{amb}=25°C	P_{tot}	0.7	W
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +150	°C

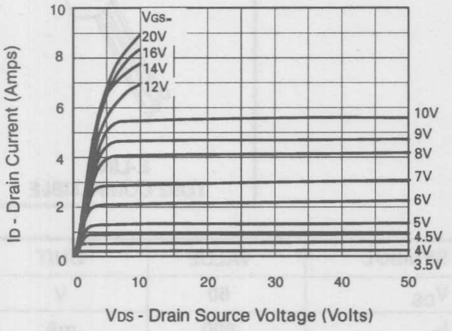
ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

PARAMETER	SYMBOL	MIN.	MAX.	UNIT	CONDITIONS.
Drain-Source Breakdown Voltage	BV_{DSS}	60		V	I_D=1mA, V_{GS}=0V
Gate-Source Threshold Voltage	$V_{GS(th)}$	1.3	3	V	I_D=1mA, V_{DS}= V_{GS}
Gate-Body Leakage	I_{GSS}		100	nA	V_{GS}=± 20V, V_{DS}=0V
Zero Gate Voltage Drain Current	I_{DSS}		10 100	µA µA	V_{DS}=60V, V_{GS}=0 V_{DS}=48V, V_{GS}=0V, T=125°C(2)
On-State Drain Current(1)	$I_{D(on)}$	3		A	V_{DS}=25V, V_{GS}=10V
Static Drain-Source On-State Resistance (1)	$R_{DS(on)}$		1 1.5	Ω Ω	V_{GS}=10V,I_D=1.5A V_{GS}=5V,I_D=500mA
Forward Transconductance(1)(2)	g_{fs}	300		mS	V_{DS}=25V,I_D=1.5A
Input Capacitance (2)	C_{iss}		100	pF	V_{DS}=25V, V_{GS}=0V, f=1MHz
Common Source Output Capacitance (2)	C_{oss}		60	pF	
Reverse Transfer Capacitance (2)	C_{rss}		20	pF	
Turn-On Delay Time (2)(3)	$t_{d(on)}$		8	ns	V_{DD}≈25V, I_D=1.5A
Rise Time (2)(3)	t_r		12	ns	
Turn-Off Delay Time (2)(3)	$t_{d(off)}$		12	ns	
Fall Time (2)(3)	t_f		15	ns	

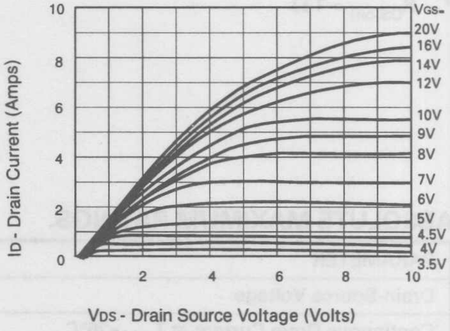
(1) Measured under pulsed conditions. Width=300µs. Duty cycle ≤2% (2) Sample test.
(3) Switching times measured with 50Ω source impedance and <5ns rise time on a pulse generator

ZVN4206A

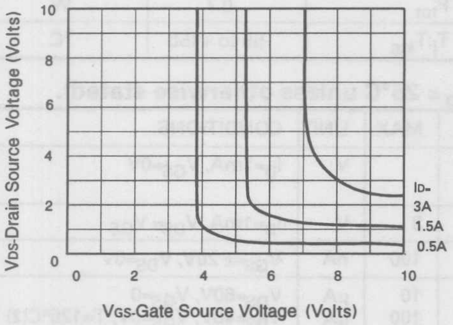
TYPICAL CHARACTERISTICS



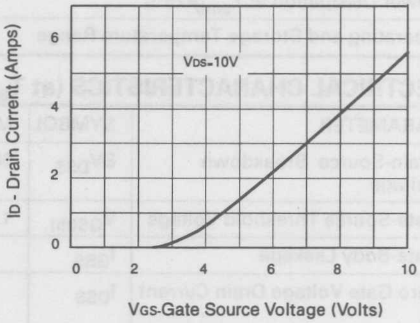
Output Characteristics



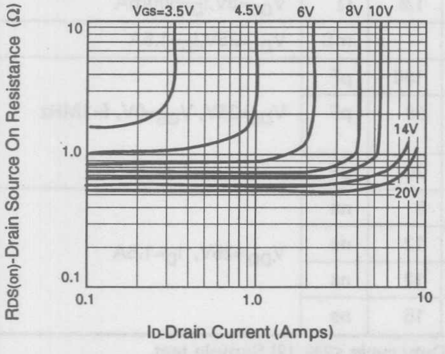
Saturation Characteristics



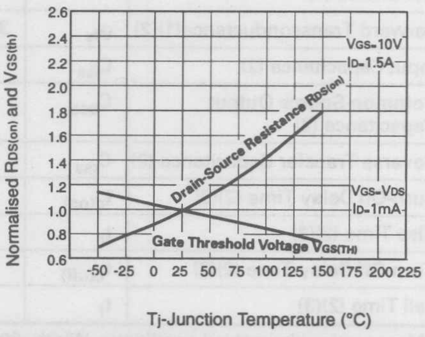
Voltage Saturation Characteristics



Transfer Characteristics

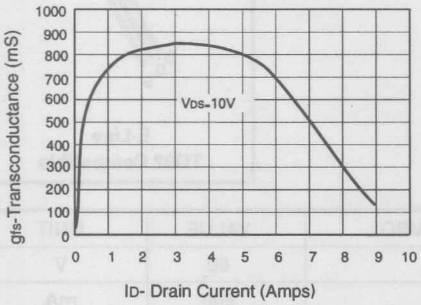


On-resistance v drain current

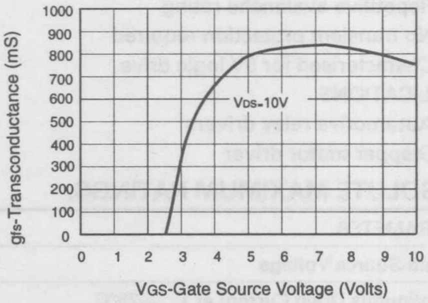


Normalised RDS(on) and VGS(th) v Temperature

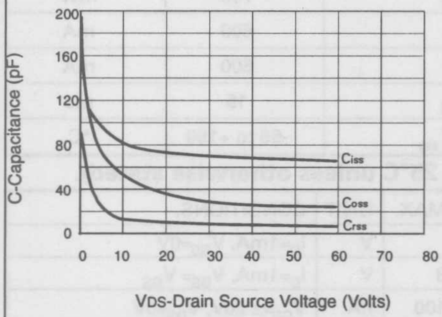
TYPICAL CHARACTERISTICS



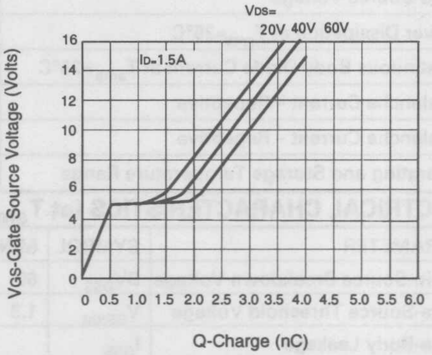
Transconductance v drain current



Transconductance v gate-source voltage



Capacitance v drain-source voltage



Gate charge v gate-source voltage

N-CHANNEL ENHANCEMENT MODE VERTICAL DMOS FET

ZVN4206AV

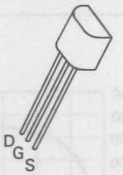
ISSUE 2 JULY 1994

FEATURES

- 60 Volt V_{DS}
- $R_{DS(on)} = 1\Omega$
- Repetitive avalanche rating
- No transient protection required
- Characterised for 5V logic drive

APPLICATIONS

- Automotive relay drivers
- Stepper motor driver



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

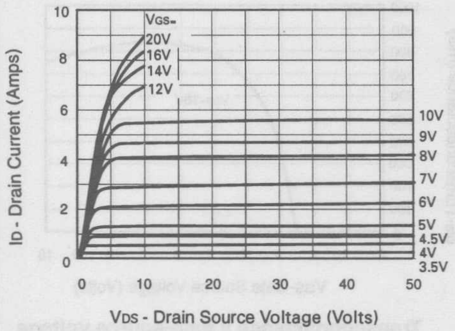
PARAMETER	SYMBOL	VALUE	UNIT
Drain-Source Voltage	V_{DS}	60	V
Continuous Drain Current at T_{amb}=25°C	I_D	600	mA
Pulsed Drain Current	I_{DM}	8	A
Gate-Source Voltage	V_{GS}	± 20	V
Power Dissipation at T_{amb}=25°C	P_{tot}	700	mW
Continuous Body Diode Current at T_{amb}=25°C	I_{SD}	600	mA
Avalanche Current – Repetitive	I_{AR}	600	mA
Avalanche Current – Repetitive	E_{AR}	15	mJ
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +150	°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

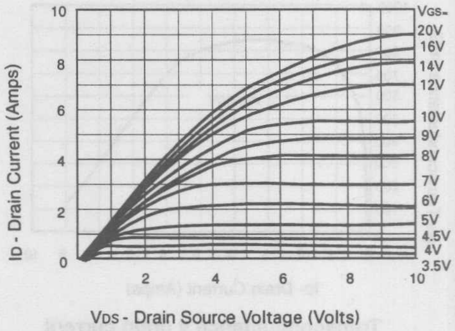
PARAMETER	SYMBOL	MIN.	MAX.	UNIT	CONDITIONS.
Drain-Source Breakdown Voltage	BV_{DSS}	60		V	I_D=1mA, V_{GS}=0V
Gate-Source Threshold Voltage	$V_{GS(th)}$	1.3	3	V	I_D=1mA, V_{DS}= V_{GS}
Gate-Body Leakage	I_{GSS}		100	nA	V_{GS}=± 20V, V_{DS}=0V
Zero Gate Voltage Drain Current	I_{DSS}		10 100	µA µA	V_{DS}=60V, V_{GS}=0 V_{DS}=48V, V_{GS}=0V, T=125°C(2)
On-State Drain Current(1)	$I_{D(on)}$	3		A	V_{DS}=25V, V_{GS}=10V
Static Drain-Source On-State Resistance (1)	$R_{DS(on)}$		1 1.5	Ω Ω	V_{GS}=10V,I_D=1.5A V_{GS}=5V,I_D=.0.5A
Forward Transconductance(1)(2)	g_{fs}	300		mS	V_{DS}=25V,I_D=1.5A
Input Capacitance (2)	C_{iss}		100	pF	V_{DS}=25V, V_{GS}=0V, f=1MHz
Common Source Output Capacitance (2)	C_{oss}		60	pF	
Reverse Transfer Capacitance (2)	C_{rss}		20	pF	
Turn-On Delay Time (2)(3)	$t_{d(on)}$		8	ns	V_{DD}≈25V, I_D=1.5A,V_{GEN}=10V
Rise Time (2)(3)	t_r		12	ns	
Turn-Off Delay Time (2)(3)	$t_{d(off)}$		12	ns	
Fall Time (2)(3)	t_f		15	ns	

(1) Measured under pulsed conditions. Width=300µs. Duty cycle ≤2% (2) Sample test.
(3) Switching times measured with 50Ω source impedance and <5ns rise time on a pulse generator

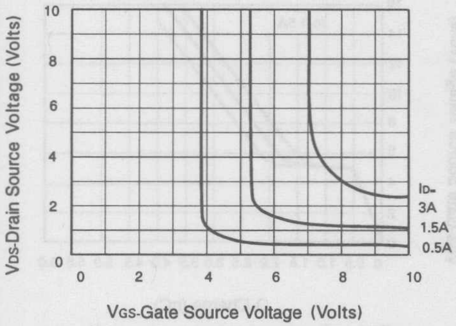
TYPICAL CHARACTERISTICS



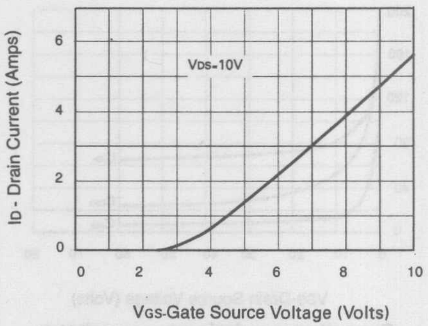
Output Characteristics



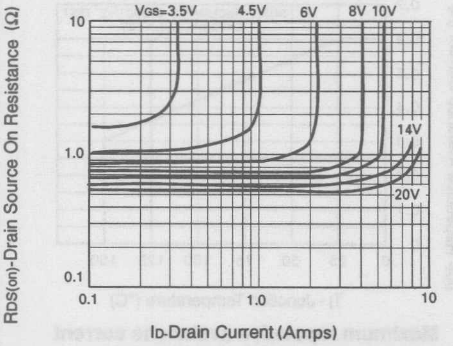
Saturation Characteristics



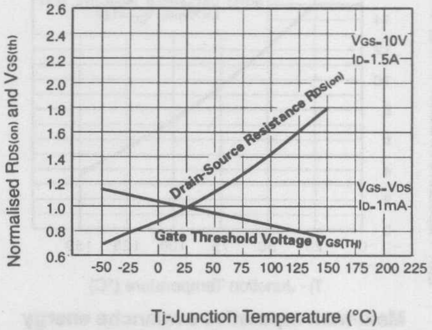
Voltage Saturation Characteristics



Transfer Characteristics

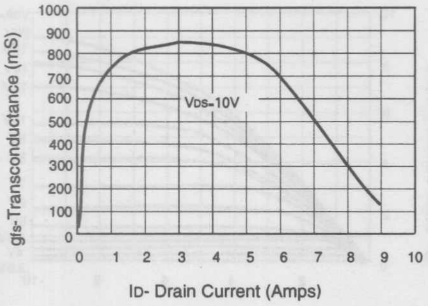


On-resistance v drain current

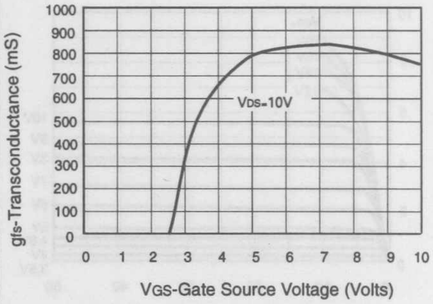


Normalised RDS(on) and VGS(th) v Temperature

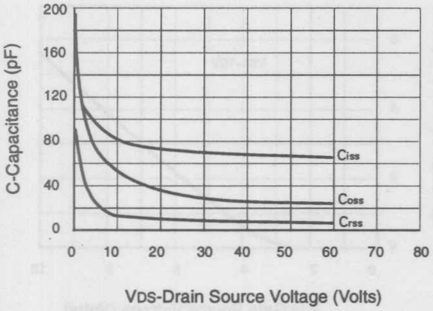
TYPICAL CHARACTERISTICS



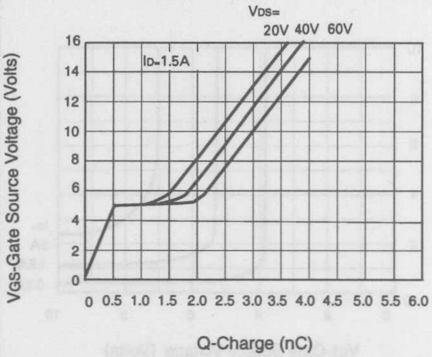
Transconductance v drain current



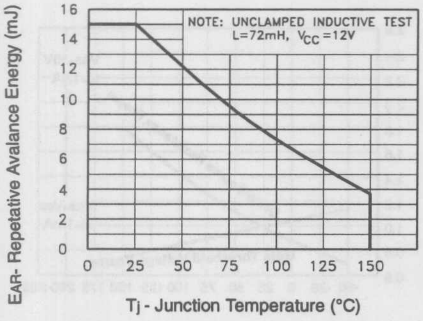
Transconductance v gate-source voltage



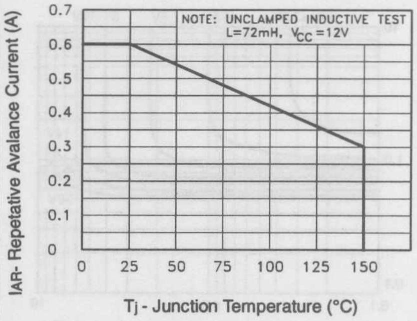
Capacitance v drain-source voltage



Gate charge v gate-source voltage



Maximum repetative avalanche energy v Junction Temperature



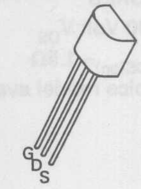
Maximum repetative avalanche current v Junction Temperature

N-CHANNEL ENHANCEMENT MODE VERTICAL DMOS FET

ZVN4206C

ISSUE 2 – JUNE 94

FEATURES
- * 60 Volt V_{DS}
- * $R_{DS(on)} = 1\ \Omega$



E-LINE
TO92 COMPATIBLE

REFER TO ZVN4206A FOR GRAPHS

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Drain-Source Voltage	V_{DS}	60	V
Continuous Drain Current at T_{amb}=25°C	I_D	600	mA
Pulsed Drain Current	I_{DM}	8	A
Gate-Source Voltage	V_{GS}	± 20	V
Power Dissipation at T_{amb}=25°C	P_{tot}	0.7	W
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +150	°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

PARAMETER	SYMBOL	MIN.	MAX.	UNIT	CONDITIONS.
Drain-Source Breakdown Voltage	BV_{DSS}	60		V	I_D=1mA, V_{GS}=0V
Gate-Source Threshold Voltage	$V_{GS(th)}$	1.3	3	V	I_D=1mA, V_{DS}= V_{GS}
Gate-Body Leakage	I_{GSS}		100	nA	V_{GS}=± 20V, V_{DS}=0V
Zero Gate Voltage Drain Current	I_{DSS}		10 100	µA µA	V_{DS}=60V, V_{GS}=0 V_{DS}=48V, V_{GS}=0V, T=125°C(2)
On-State Drain Current(1)	$I_{D(on)}$	3		A	V_{DS}=25V, V_{GS}=10V
Static Drain-Source On-State Resistance (1)	$R_{DS(on)}$		1 1.5	Ω Ω	V_{GS}=10V,I_D=1.5A V_{GS}=5V,I_D=500mA
Forward Transconductance(1)(2)	g_{fs}	300		mS	V_{DS}=25V,I_D=1.5A
Input Capacitance (2)	C_{iss}		100	pF	V_{DS}=25V, V_{GS}=0V, f=1MHz
Common Source Output Capacitance (2)	C_{oss}		60	pF	
Reverse Transfer Capacitance (2)	C_{rss}		20	pF	
Turn-On Delay Time (2)(3)	$t_{d(on)}$		8	ns	V_{DD}≈25V, I_D=1.5A
Rise Time (2)(3)	t_r		12	ns	
Turn-Off Delay Time (2)(3)	$t_{d(off)}$		12	ns	
Fall Time (2)(3)	t_f		15	ns	

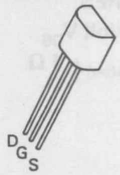
(1) Measured under pulsed conditions. Width=300µs. Duty cycle ≤2% (2) Sample test.
(3) Switching times measured with 50Ω source impedance and <5ns rise time on a pulse generator

N-CHANNEL ENHANCEMENT MODE VERTICAL DMOS FET

ZVN4210A

ISSUE 2 – MARCH 94

FEATURES
- 100 Volt V_{DS}
- $R_{DS(on)}$= 1.5Ω
- Spice model available



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

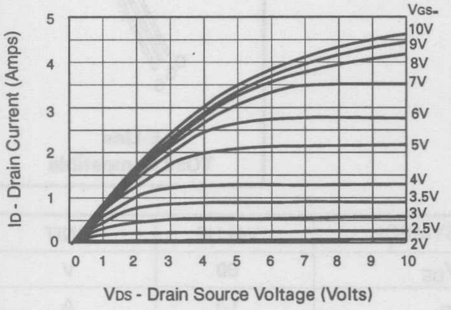
PARAMETER	SYMBOL	VALUE	UNIT
Drain-Source Voltage	V_{DS}	100	V
Continuous Drain Current at T_{amb}=25°C	I_D	450	mA
Pulsed Drain Current	I_{DM}	6	A
Gate-Source Voltage	V_{GS}	± 20	V
Power Dissipation at T_{amb}=25°C	P_{tot}	700	mW
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +150	°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

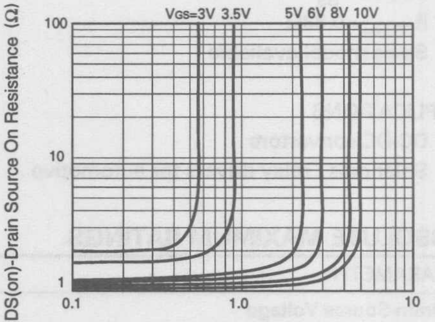
PARAMETER	SYMBOL	MIN.	MAX.	UNIT	CONDITIONS.
Drain-Source Breakdown Voltage	BV_{DSS}	100		V	I_D=1mA, V_{GS}=0V
Gate-Source Threshold Voltage	$V_{GS(th)}$	0.8	2.4	V	I_D=1mA, V_{DS}= V_{GS}
Gate-Body Leakage	I_{GSS}		100	nA	V_{GS}=± 20V, V_{DS}=0V
Zero Gate Voltage Drain Current	I_{DSS}		10 100	µA µA	V_{DS}=100V, V_{GS}=0 V_{DS}=80V, V_{GS}=0V, T=125°C(2)
On-State Drain Current(1)	$I_{D(on)}$	2.5		A	V_{DS}=25V, V_{GS}=10V
Static Drain-Source On-State Resistance (1)	$R_{DS(on)}$		1.5 1.8	Ω	V_{GS}=10V,I_D=1.5A V_{GS}=5V,I_D=500mA
Forward Transconductance(1)(2)	g_{fs}	250		mS	V_{DS}=25V,I_D=1.5A
Input Capacitance (2)	C_{iss}		100	pF	V_{DS}=25V, V_{GS}=0V, f=1MHz
Common Source Output Capacitance (2)	C_{oss}		40	pF	
Reverse Transfer Capacitance (2)	C_{rss}		12	pF	
Turn-On Delay Time (2)(3)	$t_{d(on)}$		4	ns	V_{DD}≈25V, I_D=1.5A
Rise Time (2)(3)	t_r		8	ns	
Turn-Off Delay Time (2)(3)	$t_{d(off)}$		20	ns	
Fall Time (2)(3)	t_f		30	ns	

(1) Measured under pulsed conditions. Width=300µs. Duty cycle ≤2%
(2) Sample test.
(3) Switching times measured with 50Ω source impedance and <5ns rise time on a pulse generator

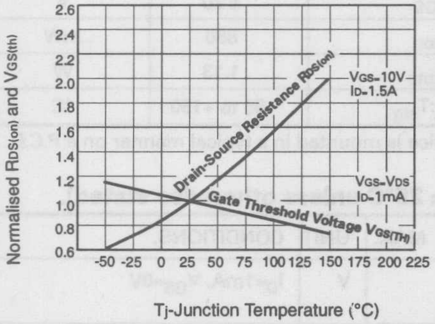
TYPICAL CHARACTERISTICS



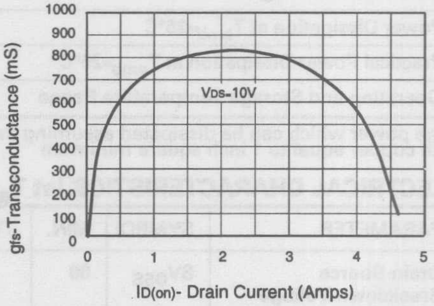
Saturation Characteristics



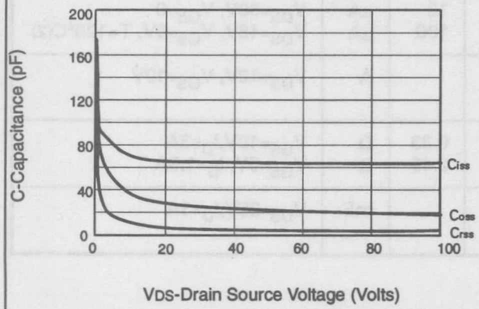
On-resistance v drain current



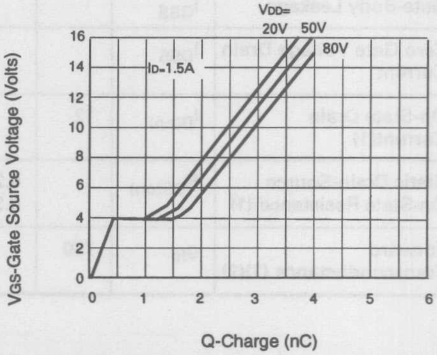
Normalised RDS(on) and VGS(th) v Temperature



Transconductance v drain current



Capacitance v drain-source voltage



Gate charge v gate-source voltage

N-CHANNEL ENHANCEMENT MODE VERTICAL DMOS FET

ZVN4306A

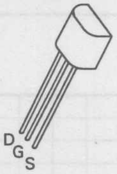
ISSUE 3 – JULY 94

FEATURES

- 60 Volt V_{DS}
- $R_{DS(on)}$= 0.33Ω
- Spice model available

APPLICATIONS

- DC-DC convertors
- Solenoids / relay drivers for automotive



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Drain-Source Voltage	V_{DS}	60	V
Continuous Drain Current at T_{amb}=25°C	I_D	1.1	A
Practical Continuous Drain Current at T_{amb}=25°C	I_{DP}	1.3	A
Pulsed Drain Current	I_{DM}	15	A
Gate Source Voltage	V_{GS}	± 20	V
Power Dissipation at T_{amb}=25°C	P_{tot}	850	mW
Practical Power Dissipation at T_{amb}=25°C*	P_{totp}	1.13	W
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +150	°C

*The power which can be dissipated assuming the device is mounted in a typical manner on a P.C.B. with copper equal to 1 inch square minimum

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Drain-Source Breakdown Voltage	BV_{DSS}	60			V	I_D=1mA, V_{GS}=0V
Gate-Source Threshold Voltage	$V_{GS(th)}$	1.3		3	V	I_D=1mA, V_{DS}= V_{GS}
Gate-Body Leakage	I_{GSS}			100	nA	V_{GS}=± 20V, V_{DS}=0V
Zero Gate Voltage Drain Current	I_{DSS}			10 100	µA µA	V_{DS}=60V, V_{GS}=0 V_{DS}=48V, V_{GS}=0V, T=125°C(2)
On-State Drain Current(1)	$I_{D(on)}$	12			A	V_{DS}=10V, V_{GS}=10V
Static Drain-Source On-State Resistance (1)	$R_{DS(on)}$		0.22 0.32	0.33 0.45	Ω Ω	V_{GS}=10V,I_D=3A V_{GS}=5V, I_D=1.5A
Forward Transconductance (1)(2)	g_{fs}	700			mS	V_{DS}=25V,I_D=3A

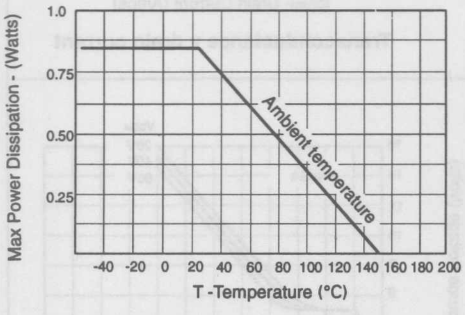
ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Input Capacitance (2)	C_{iss}			350	pF	V_{DS}=25 V, V_{GS}=0V, f=1MHz
Common Source Output Capacitance (2)	C_{oss}			140	pF	
Reverse Transfer Capacitance (2)	C_{rss}			30	pF	
Turn-On Delay Time (2)(3)	$t_{d(on)}$			8	ns	$V_{DD}\approx$25V, V_{GEN}=10V, I_D=3A
Rise Time (2)(3)	t_r			25	ns	
Turn-Off Delay Time (2)(3)	$t_{d(off)}$			30	ns	
Fall Time (2)(3)	t_f			16	ns	

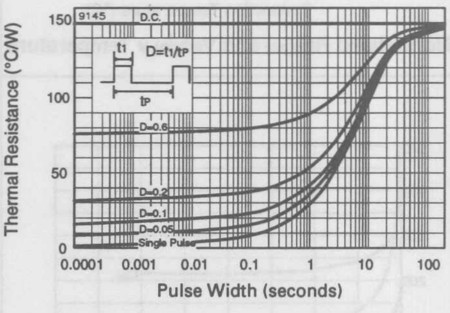
(1) Measured under pulsed conditions. Width=300µs. Duty cycle ≤2%
(2) Sample test.
(3) Switching times measured with 50Ω source impedance and <5ns rise time on a pulse generator

THERMAL CHARACTERISTICS

PARAMETER	SYMBOL	MAX.	UNIT
Thermal Resistance:Junction to Ambient Junction to Case	$R_{th(j-amb)}$ $R_{th(j-case)}$	150 50	°C/W °C/W



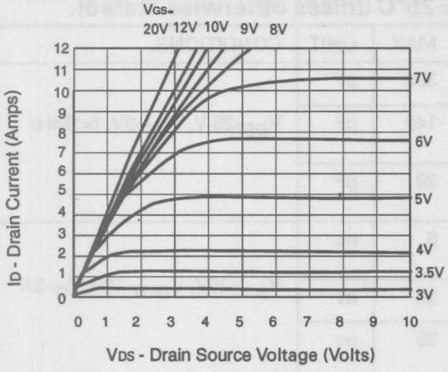
Derating curve



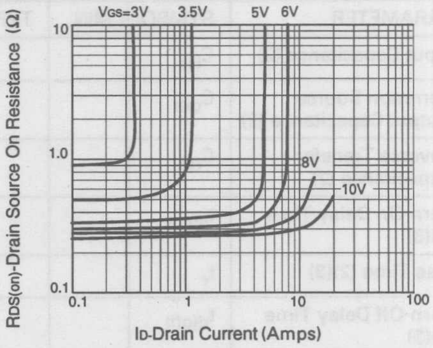
Maximum transient thermal impedance

ZVN4306A

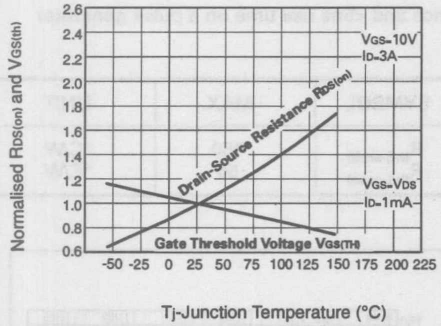
TYPICAL CHARACTERISTICS



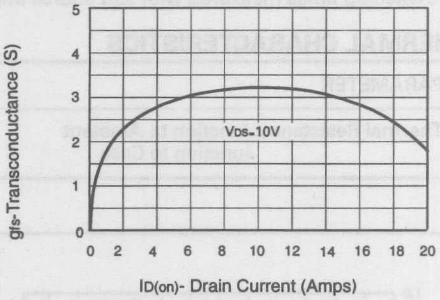
Saturation Characteristics



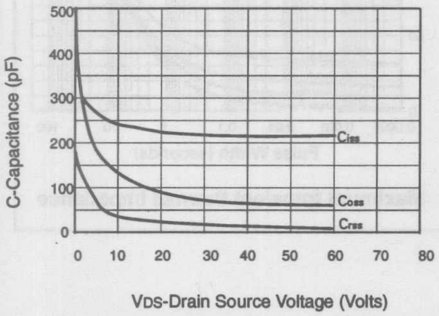
On-resistance v drain current



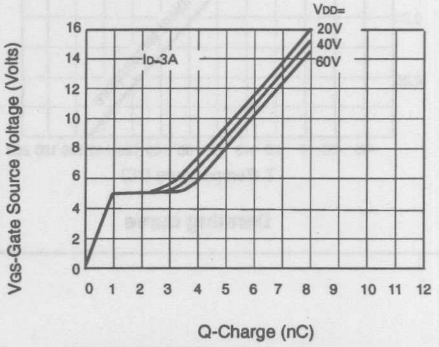
Normalised RDS(on) and VGS(th) v Temperature



Transconductance v drain current



Capacitance v drain-source voltage



Gate charge v gate-source voltage

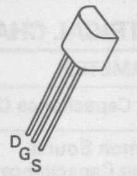
N-CHANNEL ENHANCEMENT MODE VERTICAL DMOS FET

ZVN4310A

ISSUE 2 – MARCH 94

FEATURES

- 100 Volt V_{DS}
- $R_{DS(on)} = 0.5\Omega$
- Spice model available



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Drain-Source Voltage	V_{DS}	100	V
Continuous Drain Current at T_{amb}=25°C	I_D	0.9	A
Practical Continuous Drain Current at T_{amb}=25°C	I_{DP}	1	A
Pulsed Drain Current	I_{DM}	12	A
Gate Source Voltage	V_{GS}	± 20	V
Power Dissipation at T_{amb}=25°C	P_{tot}	850	mW
Practical Power Dissipation at T_{amb}=25°C*	P_{totp}	1.13	W
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +150	°C

*The power which can be dissipated assuming the device is mounted in a typical manner on a P.C.B. with copper equal to 1 inch square minimum

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Drain-Source Breakdown Voltage	BV_{DSS}	100			V	I_D=1mA, V_{GS}=0V
Gate-Source Threshold Voltage	$V_{GS(th)}$	1		3	V	I_D=1mA, V_{DS}= V_{GS}
Gate-Body Leakage	I_{GSS}			20	nA	V_{GS}=± 20V, V_{DS}=0V
Zero Gate Voltage Drain Current	I_{DSS}			10 100	µA µA	V_{DS}=100V, V_{GS}=0 V_{DS}=80V, V_{GS}=0V, T=125°C(2)
On-State Drain Current(1)	$I_{D(on)}$	9			A	V_{DS}=25 V, V_{GS}=10V
Static Drain-Source On-State Resistance (1)	$R_{DS(on)}$		0.36 0.48	0.5 0.65	Ω Ω	V_{GS}=10V,I_D=3A V_{GS}=5V, I_D=1.5A
Forward Transconductance (1)(2)	g_{fs}	600			mS	V_{DS}=25V,I_D=3A

ZVN4310A

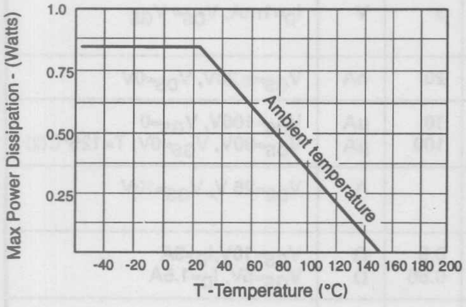
ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Input Capacitance (2)	C_{iss}			350	pF	V_{DS}=25 V, V_{GS}=0V, f=1MHz
Common Source Output Capacitance (2)	C_{oss}			140	pF	
Reverse Transfer Capacitance (2)	C_{rss}			30	pF	
Turn-On Delay Time (2)(3)	$t_{d(on)}$			8	ns	V_{DD}≈25V, V_{GEN}=10V, I_D=3A R_{GS}=50Ω
Rise Time (2)(3)	t_r			25	ns	
Turn-Off Delay Time (2)(3)	$t_{d(off)}$			30	ns	
Fall Time (2)(3)	t_f			16	ns	

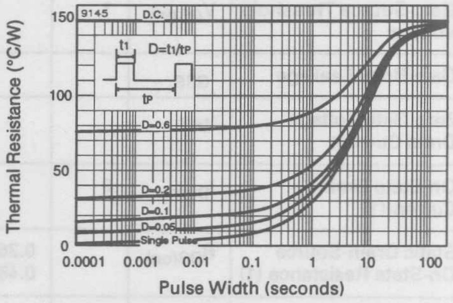
(1) Measured under pulsed conditions. Width=300µs. Duty cycle ≤2%
(2) Sample test.
(3) Switching times measured with 50Ω source impedance and <5ns rise time on a pulse generator

THERMAL CHARACTERISTICS

PARAMETER	SYMBOL	MAX.	UNIT
Thermal Resistance:Junction to Ambient	$R_{th(j-amb)}$	150	°C/W
Junction to Case	$R_{th(j-case)}$	50	°C/W

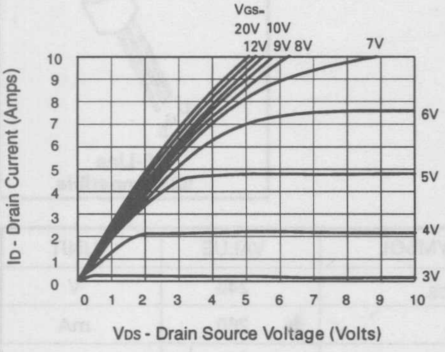


Derating curve

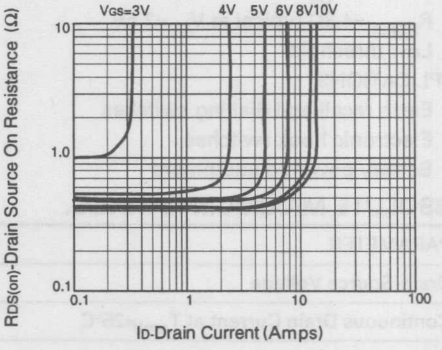


Maximum transient thermal impedance

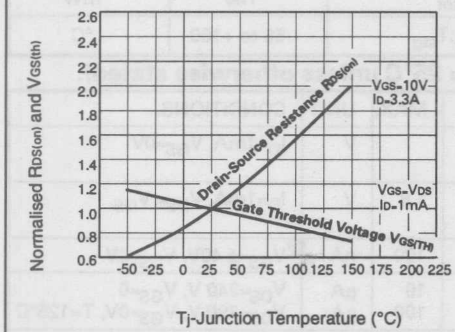
TYPICAL CHARACTERISTICS



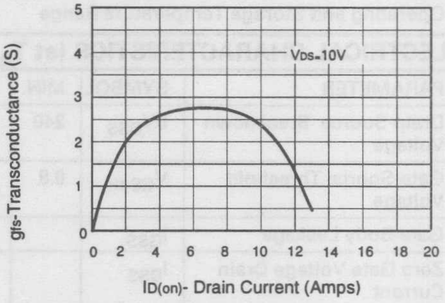
Saturation Characteristics



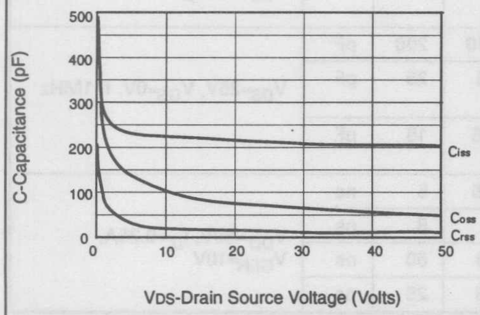
On-resistance v drain current



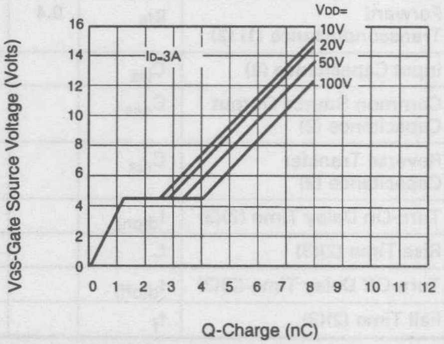
Normalised RDS(on) and VGS(th) v Temperature



Transconductance v drain current



Capacitance v drain-source voltage



Gate charge v gate-source voltage

N-CHANNEL ENHANCEMENT MODE VERTICAL DMOS FET

ZVN4424A

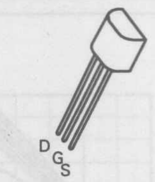
ISSUE 2 January 1994

FEATURES

- 240 Volt V_{DS}
- $R_{DS(on)}$=4.3Ω typical at V_{GS}=2.5V
- Low threshold

APPLICATIONS

- Earth recall and dialling switches
- Electronic hook switches
- Battery powered equipment



E-Line
92 Compatible

ABSOLUTE MAXIMUM RATINGS.

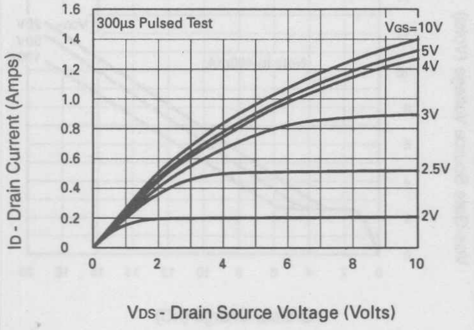
PARAMETER	SYMBOL	VALUE	UNIT
Drain-Source Voltage	V_{DS}	240	V
Continuous Drain Current at T_{amb}=25°C	I_D	260	mA
Pulsed Drain Current	I_{DM}	1.0	A
Gate Source Voltage	V_{GS}	± 40	V
Power Dissipation at T_{amb}=25°C	P_{tot}	750	mW
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +150	°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

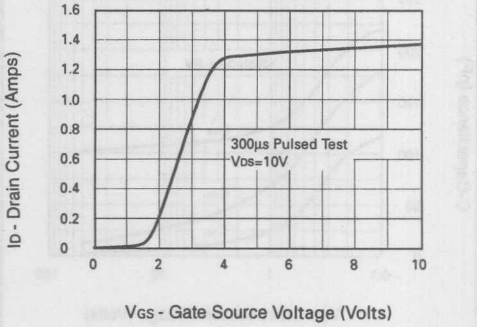
PARAMETER	SYMBOL	MIN.	TYP	MAX.	UNIT	CONDITIONS.
Drain-Source Breakdown Voltage	BV_{DSS}	240			V	I_D=1mA, V_{GS}=0V
Gate-Source Threshold Voltage	$V_{GS(th)}$	0.8		1.8	V	I_D=1mA, V_{DS}= V_{GS}
Gate-Body Leakage	I_{GSS}			100	nA	V_{GS}=± 40V, V_{DS}=0V
Zero Gate Voltage Drain Current	I_{DSS}			10 100	µA µA	V_{DS}=240 V, V_{GS}=0 V_{DS}=190 V, V_{GS}=0V, T=125°C
On-State Drain Current (1)	$I_{D(on)}$	0.8	1.4		A	V_{DS}=10 V, V_{GS}=10V
Static Drain-Source On-State Resistance (1)	$R_{DS(on)}$		4 4.3	5.5 6	Ω Ω	V_{GS}=10V,I_D=500mA V_{GS}=2.5V,I_D=100mA
Forward Transconductance (1) (2)	g_{fs}	0.4	0.75		S	V_{DS}=10V,I_D=0.5A
Input Capacitance (2)	C_{iss}		110	200	pF	V_{DS}=25V, V_{GS}=0V, f=1MHz
Common Source Output Capacitance (2)	C_{oss}		15	25	pF	
Reverse Transfer Capacitance (2)	C_{rss}		3.5	15	pF	
Turn-On Delay Time (2)(3)	$t_{d(on)}$		2.5	5	ns	V_{DD} ≈50V, I_D =0.25A, V_{GEN}=10V
Rise Time (2)(3)	t_r		5	8	ns	
Turn-Off Delay Time (2)(3)	$t_{d(off)}$		40	60	ns	
Fall Time (2)(3)	t_f		16	25	ns	

(1) Measured under pulsed conditions. Width=300µs. Duty cycle ≤2% (2) Sample test.
(3) Switching times measured with 50Ω source impedance and <5ns rise time on a pulse generator

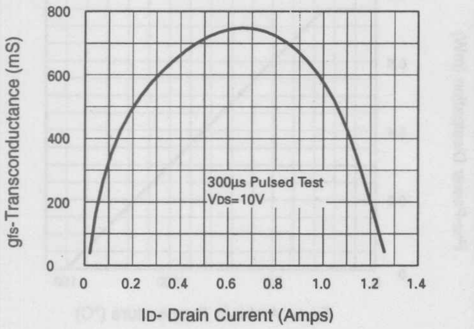
TYPICAL CHARACTERISTICS



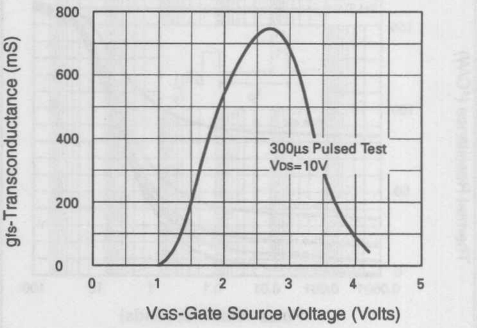
Saturation Characteristics



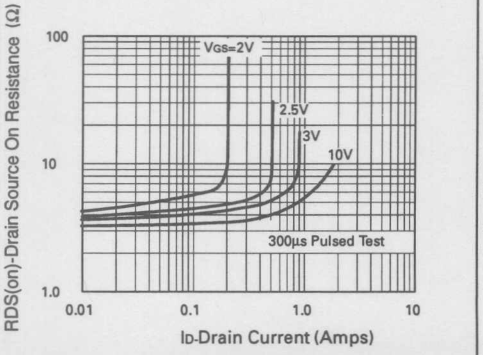
Transfer Characteristics



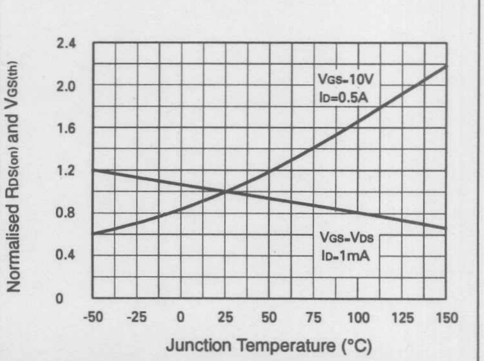
Transconductance v drain current



Transconductance v gate-source voltage

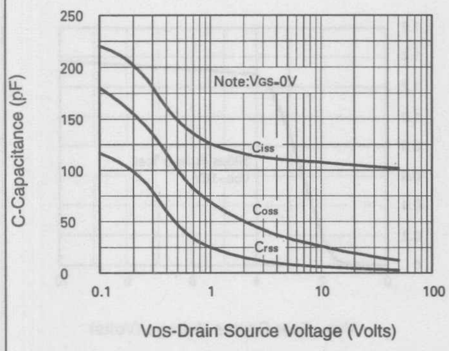


On-resistance vs Drain Current

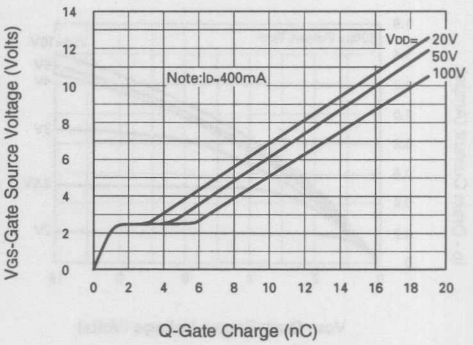


Normalised RDS(on) and VGS(th) vs Temperature

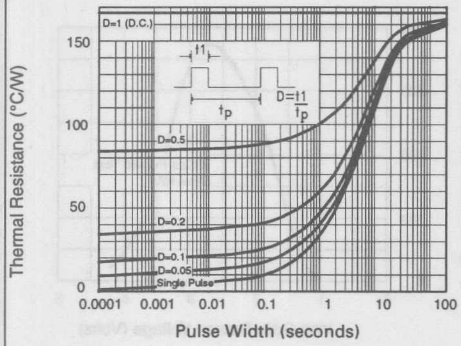
TYPICAL CHARACTERISTICS



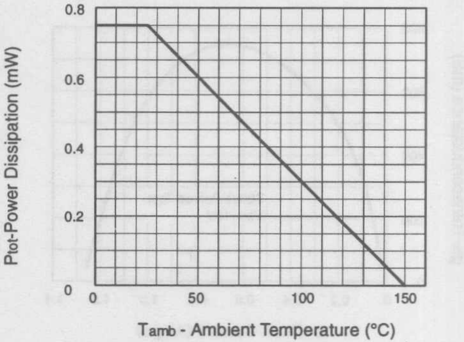
Capacitance v drain-source voltage



Gate charge v gate-source voltage



Maximum transient thermal impedance



Derating Curve

N-CHANNEL ENHANCEMENT MODE VERTICAL DMOS FET

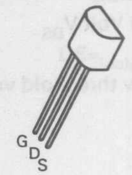
ZVN4424C

ISSUE 2 January 1994

FEATURES

- * 240 Volt V_{DS}
- * $R_{DS(on)}$=4.3Ω typical at V_{GS}=2.5V
- * Low threshold

REFER TO ZVN4424A FOR GRAPHS



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Drain-Source Voltage	V_{DS}	240	V
Continuous Drain Current at T_{amb}=25°C	I_D	260	mA
Pulsed Drain Current	I_{DM}	1.0	A
Gate Source Voltage	V_{GS}	± 40	V
Power Dissipation at T_{amb}=25°C	P_{tot}	750	mW
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +150	°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

PARAMETER	SYMBOL	MIN.	TYP	MAX.	UNIT	CONDITIONS.
Drain-Source Breakdown Voltage	BV_{DSS}	240			V	I_D=1mA, V_{GS}=0V
Gate-Source Threshold Voltage	$V_{GS(th)}$	0.8		1.8	V	I_D=1mA, V_{DS}= V_{GS}
Gate-Body Leakage	I_{GSS}			100	nA	V_{GS}=± 40V, V_{DS}=0V
Zero Gate Voltage Drain Current	I_{DSS}			10 100	µA µA	V_{DS}=240 V, V_{GS}=0 V_{DS}=190 V, V_{GS}=0V, T=125°C
On-State Drain Current (1)	$I_{D(on)}$	0.8	1.4		A	V_{DS}=10 V, V_{GS}=10V
Static Drain-Source On-State Resistance (1)	$R_{DS(on)}$		4 4.3	5.5 6	Ω Ω	V_{GS}=10V,I_D=500mA V_{GS}=2.5V,I_D=100mA
Forward Transconductance (1) (2)	g_{fs}	0.4	0.75		S	V_{DS}=10V,I_D=0.5A
Input Capacitance (2)	C_{iss}		110	200	pF	V_{DS}=25V, V_{GS}=0V, f=1MHz
Common Source Output Capacitance (2)	C_{oss}		15	25	pF	
Reverse Transfer Capacitance (2)	C_{rss}		3.5	15	pF	
Turn-On Delay Time (2)(3)	$t_{d(on)}$		2.5	5	ns	V_{DD}≈50V, I_D=0.25A, V_{GEN}=10V
Rise Time (2)(3)	t_r		5	8	ns	
Turn-Off Delay Time (2)(3)	$t_{d(off)}$		40	60	ns	
Fall Time (2)(3)	t_f		16	25	ns	

(1) Measured under pulsed conditions. Width=300µs. Duty cycle ≤2% (2) Sample test.
(3) Switching times measured with 50Ω source impedance and <5ns rise time on a pulse generator

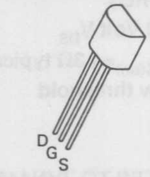
N-CHANNEL ENHANCEMENT MODE VERTICAL DMOS FET

ZVNL110A

ISSUE 2 – MARCH 94

FEATURES

- 100 Volt V_{DS}
- $R_{DS(on)}=3\Omega$
- Low threshold voltage



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Drain-Source Voltage	V_{DS}	100	V
Continuous Drain Current at T_{amb}=25°C	I_D	320	mA
Pulsed Drain Current	I_{DM}	6	A
Gate Source Voltage	V_{GS}	± 20	V
Power Dissipation at T_{amb}=25°C	P_{tot}	700	mW
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +150	°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

PARAMETER	SYMBOL	MIN.	MAX.	UNIT	CONDITIONS.
Drain-Source Breakdown Voltage	BV_{DSS}	100		V	I_D=1mA, V_{GS}=0V
Gate-Source Threshold Voltage	$V_{GS(th)}$	0.75	1.5	V	I_D=1mA, V_{DS}= V_{GS}
Gate-Body Leakage	I_{GSS}		100	nA	V_{GS}=± 20V, V_{DS}=0V
Zero Gate Voltage Drain Current	I_{DSS}		10 500	µA µA	V_{DS}=100 V, V_{GS}=0 V_{DS}=80 V, V_{GS}=0V, T=125°C (2)
On-State Drain Current(1)	$I_{D(on)}$	750		mA	V_{DS}=25 V, V_{GS}=5V
Static Drain-Source On-State Resistance (1)	$R_{DS(on)}$		4.5 3.0	Ω Ω	V_{GS}=5V,I_D=250mA V_{GS}=10V, I_D=500mA
Forward Transconductance (1)(2)	g_{fs}	225		mS	V_{DS}=25V,I_D=500mA
Input Capacitance (2)	C_{iss}		75	pF	V_{DS}=25 V, V_{GS}=0V, f=1MHz
Common Source Output Capacitance (2)	C_{oss}		25	pF	
Reverse Transfer Capacitance (2)	C_{rss}		8	pF	
Turn-On Delay Time (2)(3)	$t_{d(on)}$		7	ns	V_{DD}≈25V, V_{GS}=10V, I_D=1A
Rise Time (2)(3)	t_r		12	ns	
Turn-Off Delay Time (2)(3)	$t_{d(off)}$		15	ns	
Fall Time (2)(3)	t_f		13	ns	

(1) Measured under pulsed conditions. Width=300µs. Duty cycle ≤2% (2) Sample test.
(3) Switching times measured with 50Ω source impedance and <5ns rise time on a pulse generator

N-CHANNEL ENHANCEMENT MODE VERTICAL DMOS FET

ZVNL120A

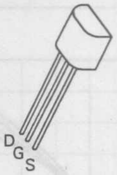
ISSUE 2 – MARCH 94

FEATURES

- 200 Volt V_{DS}
- $R_{DS(on)}=10\Omega$
- Low threshold

APPLICATIONS

- Telephone handsets



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

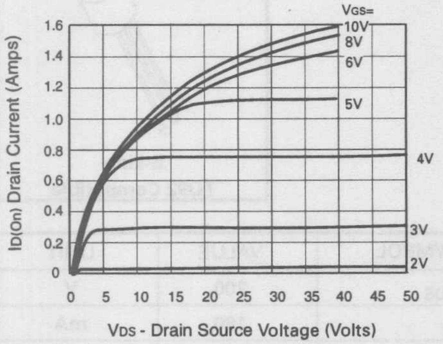
PARAMETER	SYMBOL	VALUE	UNIT
Drain-Source Voltage	V_{DS}	200	V
Continuous Drain Current at T_{amb}=25°C	I_D	180	mA
Pulsed Drain Current	I_{DM}	2	A
Gate Source Voltage	V_{GS}	± 20	V
Power Dissipation at T_{amb}=25°C	P_{tot}	700	mW
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +150	°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

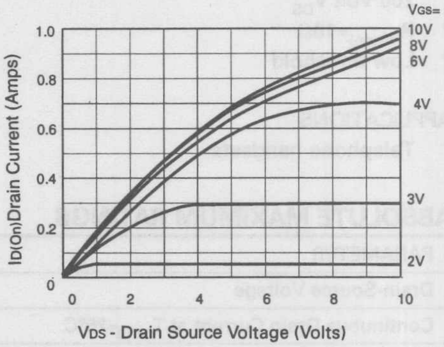
PARAMETER	SYMBOL	MIN.	MAX.	UNIT	CONDITIONS.
Drain-Source Breakdown Voltage	BV_{DSS}	200		V	I_D=1mA, V_{GS}=0V
Gate-Source Threshold Voltage	$V_{GS(th)}$	0.5	1.5	V	I_D=1mA, V_{DS}= V_{GS}
Gate-Body Leakage	I_{GSS}		100	nA	V_{GS}=± 20V, V_{DS}=0V
Zero Gate Voltage Drain Current	I_{DSS}		10 100	µA µA	V_{DS}=200 V, V_{GS}=0 V_{DS}=160 V, V_{GS}=0V, T=125°C(2)
On-State Drain Current(1)	$I_{D(on)}$	500		mA	V_{DS}=25 V, V_{GS}=5V
Static Drain-Source On-State Resistance (1)	$R_{DS(on)}$		10 10	Ω Ω	V_{GS}=5V,I_D=250mA V_{GS}=3V, I_D=125mA
Forward Transconductance (1)(2)	g_{fs}	200		mS	V_{DS}=25V,I_D=250mA
Input Capacitance (2)	C_{iss}		85	pF	V_{DS}=25 V, V_{GS}=0V, f=1MHz
Common Source Output Capacitance (2)	C_{oss}		20	pF	
Reverse Transfer Capacitance (2)	C_{rss}		7	pF	
Turn-On Delay Time (2)(3)	$t_{d(on)}$		8	ns	V_{DD}≈25V, I_D=250mA
Rise Time (2)(3)	t_r		8	ns	
Turn-Off Delay Time (2)(3)	$t_{d(off)}$		20	ns	
Fall Time (2)(3)	t_f		12	ns	

(1) Measured under pulsed conditions. Width=300µs. Duty cycle ≤2% (2) Sample test.
(3) Switching times measured with 50Ω source impedance and <5ns rise time on a pulse generator

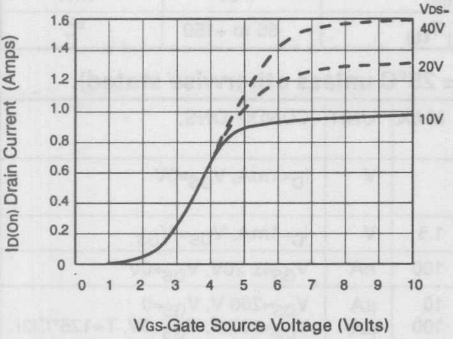
TYPICAL CHARACTERISTICS



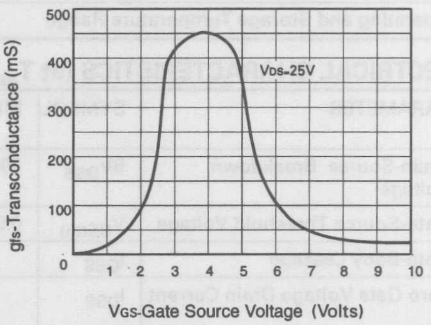
Output Characteristics



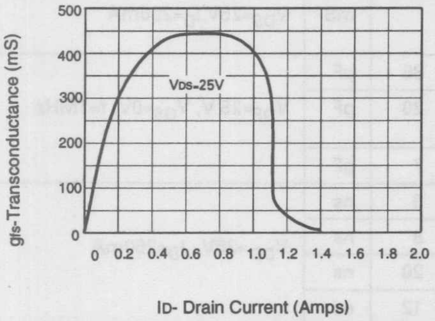
Saturation Characteristics



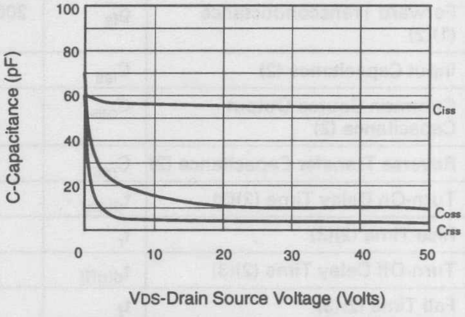
Transfer Characteristics



Transconductance v gate-source voltage



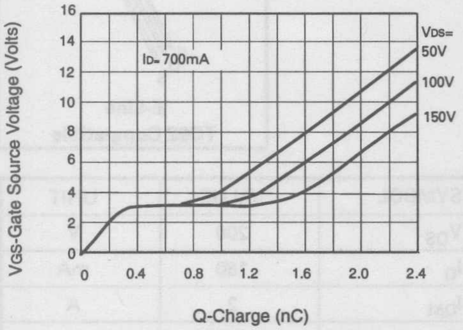
Transconductance v drain current



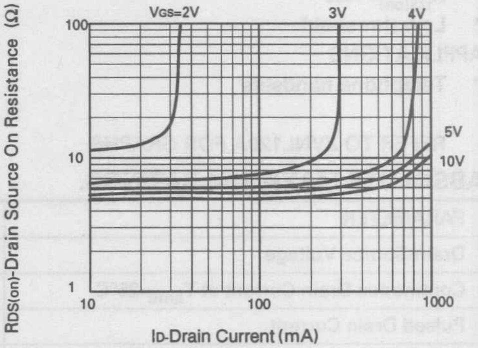
Capacitance v drain-source voltage

ZVNL120A

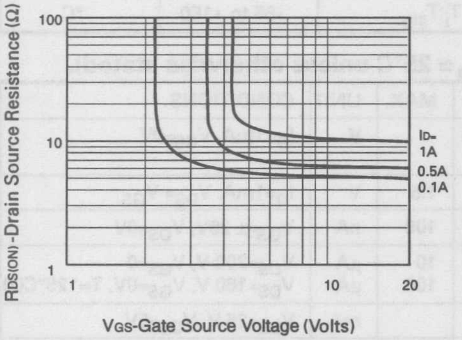
TYPICAL CHARACTERISTICS



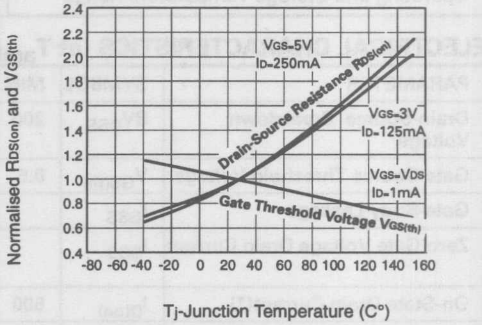
Gate charge v gate-source voltage



On-resistance v drain current



On-resistance vs gate-source voltage



Normalised RDS(on) and VGS(th) vs Temperature

N-CHANNEL ENHANCEMENT MODE VERTICAL DMOS FET

ZVNL120C

ISSUE 2 – MARCH 94

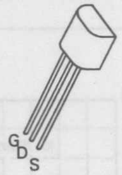
FEATURES

- 200 Volt V_{DS}
- $R_{DS(on)}$=10Ω
- Low threshold

APPLICATIONS

- Telephone handsets

REFER TO ZVNL120A FOR GRAPHS



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Drain-Source Voltage	V_{DS}	200	V
Continuous Drain Current at T_{amb}=25°C	I_D	180	mA
Pulsed Drain Current	I_{DM}	2	A
Gate Source Voltage	V_{GS}	± 20	V
Power Dissipation at T_{amb}=25°C	P_{tot}	700	mW
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +150	°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

PARAMETER	SYMBOL	MIN.	MAX.	UNIT	CONDITIONS.
Drain-Source Breakdown Voltage	BV_{DSS}	200		V	I_D=1mA, V_{GS}=0V
Gate-Source Threshold Voltage	$V_{GS(th)}$	0.5	1.5	V	I_D=1mA, V_{DS}= V_{GS}
Gate-Body Leakage	I_{GSS}		100	nA	V_{GS}=± 20V, V_{DS}=0V
Zero Gate Voltage Drain Current	I_{DSS}		10 100	µA µA	V_{DS}=200 V, V_{GS}=0 V_{DS}=160 V, V_{GS}=0V, T=125°C(2)
On-State Drain Current(1)	$I_{D(on)}$	500		mA	V_{DS}=25 V, V_{GS}=5V
Static Drain-Source On-State Resistance (1)	$R_{DS(on)}$		10 10	Ω Ω	V_{GS}=5V,I_D=250mA V_{GS}=3V, I_D=125mA
Forward Transconductance (1)(2)	g_{fs}	200		mS	V_{DS}=25V,I_D=250mA
Input Capacitance (2)	C_{iss}		85	pF	V_{DS}=25 V, V_{GS}=0V, f=1MHz
Common Source Output Capacitance (2)	C_{oss}		20	pF	
Reverse Transfer Capacitance (2)	C_{rss}		7	pF	
Turn-On Delay Time (2)(3)	$t_{d(on)}$		8	ns	V_{DD}≈25V, I_D=250mA
Rise Time (2)(3)	t_r		8	ns	
Turn-Off Delay Time (2)(3)	$t_{d(off)}$		20	ns	
Fall Time (2)(3)	t_f		12	ns	

(1) Measured under pulsed conditions. Width=300µs. Duty cycle ≤2%
(2) Sample test.
(3) Switching times measured with 50Ω source impedance and <5ns rise time on a pulse generator

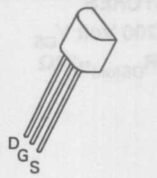
N-CHANNEL ENHANCEMENT MODE VERTICAL DMOS FET

ZVNL535A

ISSUE 2 – MARCH 94

FEATURES

- 350 Volt V_{DS}
- $R_{DS(on)}$=40Ω



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Drain-Source Voltage	V_{DS}	350	V
Continuous Drain Current at T_{amb}=25°C	I_D	90	mA
Pulsed Drain Current	I_{DM}	800	mA
Gate Source Voltage	V_{GS}	± 20	V
Power Dissipation at T_{amb}=25°C	P_{tot}	700	mW
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +150	°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

PARAMETER	SYMBOL	MIN.	MAX.	UNIT	CONDITIONS.
Drain-Source Breakdown Voltage	BV_{DSS}	350		V	I_D=1mA, V_{GS}=0V
Gate-Source Threshold Voltage	$V_{GS(th)}$	0.5	1.5	V	I_D=1mA, V_{DS}= V_{GS}
Gate-Body Leakage	I_{GSS}		100	nA	V_{GS}=± 20V, V_{DS}=0V
Zero Gate Voltage Drain Current	I_{DSS}		50 400	µA µA	V_{DS}=350 V, V_{GS}=0 V_{DS}=280 V, V_{GS}=0V, T=125°C(2)
On-State Drain Current(1)	$I_{D(on)}$	200		mA	V_{DS}=25 V, V_{GS}=5V
Static Drain-Source On-State Resistance (1)	$R_{DS(on)}$		40 40	Ω Ω	V_{GS}=5V,I_D=100mA V_{GS}=3V,I_D=50mA
Forward Transconductance (1)(2)	g_{fs}	100		mS	V_{DS}=25V,I_D=100mA
Input Capacitance (2)	C_{iss}		70	pF	V_{DS}=25 V, V_{GS}=0V, f=1MHz
Common Source Output Capacitance (2)	C_{oss}		10	pF	
Reverse Transfer Capacitance (2)	C_{rss}		4	pF	
Turn-On Delay Time (2)(3)	$t_{d(on)}$		7	ns	V_{DD}≈25V, I_D=100mA
Rise Time (2)(3)	t_r		7	ns	
Turn-Off Delay Time (2)(3)	$t_{d(off)}$		16	ns	
Fall Time (2)(3)	t_f		10	ns	

(1) Measured under pulsed conditions. Width=300µs. Duty cycle ≤2%
(2) Sample test.
(3) Switching times measured with 50Ω source impedance and <5ns rise time on a pulse generator

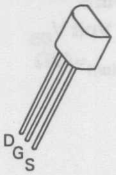
P-CHANNEL ENHANCEMENT MODE VERTICAL DMOS FET

ISSUE 2 – MARCH 94

ZVP0120A

FEATURES

- 200 Volt V_{DS}
- $R_{DS(on)}=32\Omega$



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

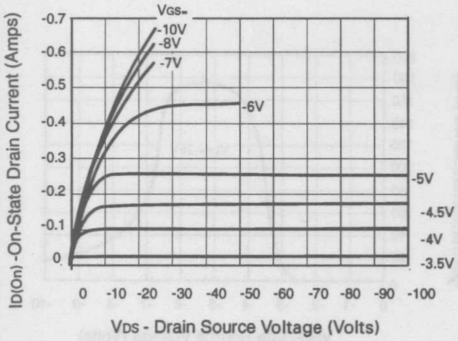
PARAMETER	SYMBOL	VALUE	UNIT
Drain-Source Voltage	V_{DS}	-200	V
Continuous Drain Current at $T_{amb}=25°C$	I_D	-110	mA
Pulsed Drain Current	I_{DM}	-1	A
Gate Source Voltage	V_{GS}	± 20	V
Power Dissipation at $T_{amb}=25°C$	P_{tot}	700	mW
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +150	°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

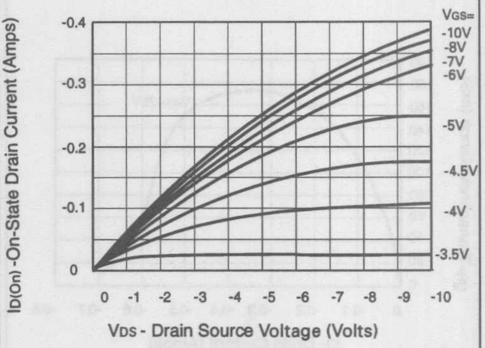
PARAMETER	SYMBOL	MIN.	MAX.	UNIT	CONDITIONS.
Drain-Source Breakdown Voltage	BV_{DSS}	-200		V	$I_D=-1mA$, $V_{GS}=0V$
Gate-Source Threshold Voltage	$V_{GS(th)}$	-1.5	-3.5	V	$I_D=-1mA$, $V_{DS}=V_{GS}$
Gate-Body Leakage	I_{GSS}		20	nA	$V_{GS}=\pm 20V$, $V_{DS}=0V$
Zero Gate Voltage Drain Current	I_{DSS}		-10 -100	µA µA	$V_{DS}=-200$ V, $V_{GS}=0$ $V_{DS}=-160$ V, $V_{GS}=0V$, T=125°C(2)
On-State Drain Current(1)	$I_{D(on)}$	-250		mA	$V_{DS}=-25$ V, $V_{GS}=-10V$
Static Drain-Source On-State Resistance (1)	$R_{DS(on)}$		32	Ω	$V_{GS}=-10V$, $I_D=-125mA$
Forward Transconductance (1)(2)	g_{fs}	50		mS	$V_{DS}=-25V$, $I_D=-125mA$
Input Capacitance (2)	C_{iss}		100	pF	$V_{DS}=-25$ V, $V_{GS}=0V$, f=1MHz
Common Source Output Capacitance (2)	C_{oss}		25	pF	
Reverse Transfer Capacitance (2)	C_{rss}		7	pF	
Turn-On Delay Time (2)(3)	$t_{d(on)}$		7	ns	$V_{DD}\approx-25V$, $I_D=-125mA$
Rise Time (2)(3)	t_r		15	ns	
Turn-Off Delay Time (2)(3)	$t_{d(off)}$		12	ns	
Fall Time (2)(3)	t_f		15	ns	

(1) Measured under pulsed conditions. Width=300µs. Duty cycle ≤2% (2) Sample test.
(3) Switching times measured with 50Ω source impedance and <5ns rise time on a pulse generator

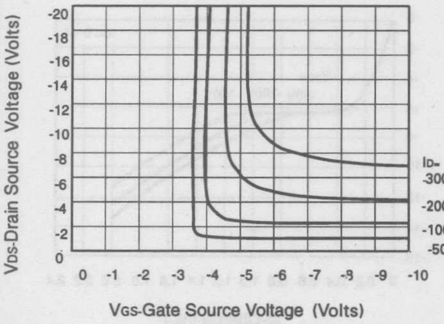
TYPICAL CHARACTERISTICS



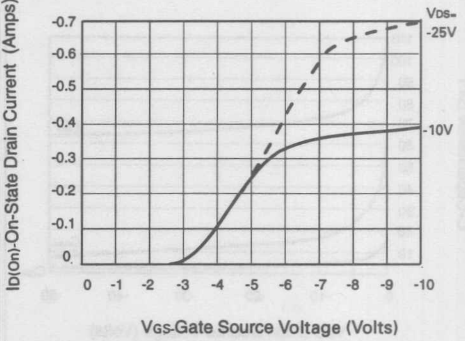
Output Characteristics



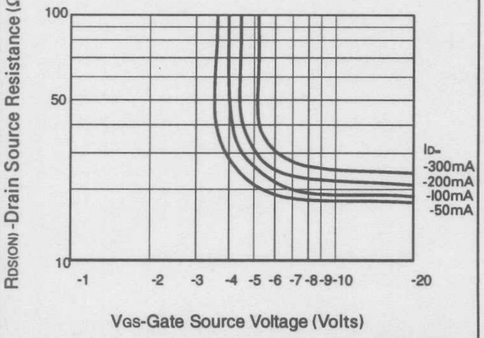
Saturation Characteristics



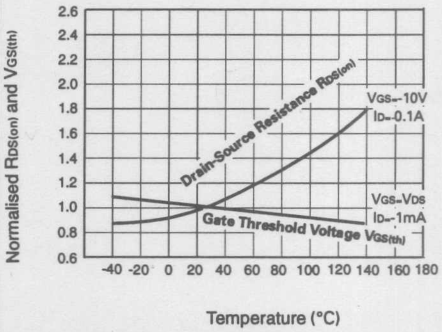
Voltage Saturation Characteristics



Transfer Characteristics

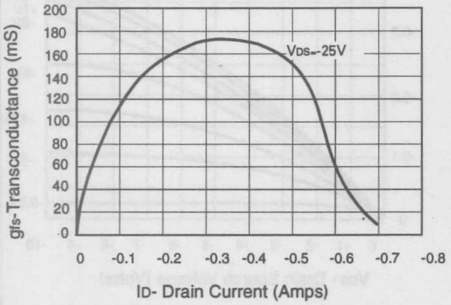


On-resistance vs gate-source voltage

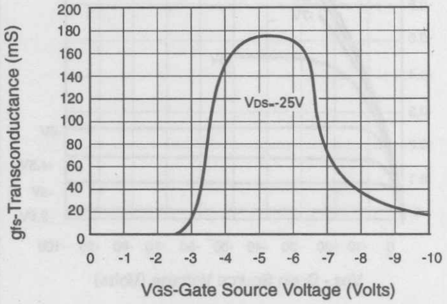


Normalised RDS(on) and VGS(th) vs Temperature

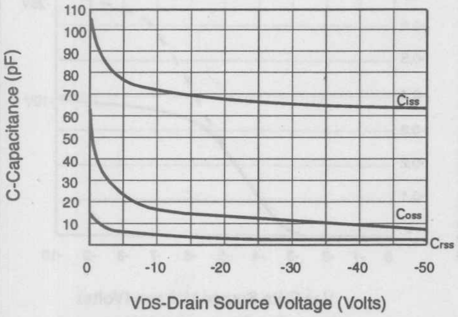
TYPICAL CHARACTERISTICS



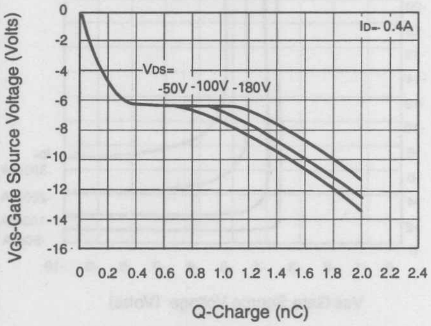
Transconductance v drain current



Transconductance v gate-source voltage



Capacitance v drain-source voltage



Gate charge v gate-source voltage

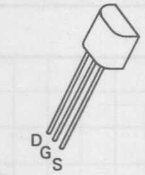
P-CHANNEL ENHANCEMENT MODE VERTICAL DMOS FET

ZVP0535A

ISSUE 2 – MARCH 94

FEATURES

- 350 Volt V_{DS}
- $R_{DS(on)}$=100Ω



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Drain-Source Voltage	V_{DS}	-350	V
Continuous Drain Current at T_{amb}=25°C	I_D	-50	mA
Pulsed Drain Current	I_{DM}	-480	mA
Gate Source Voltage	V_{GS}	± 20	V
Power Dissipation at T_{amb}=25°C	P_{tot}	700	mW
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +150	°C

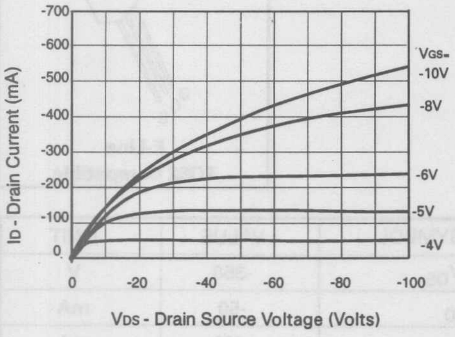
ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

PARAMETER	SYMBOL	MIN.	MAX.	UNIT	CONDITIONS.
Drain-Source Breakdown Voltage	BV_{DSS}	-350		V	I_D=-1mA, V_{GS}=0V
Gate-Source Threshold Voltage	$V_{GS(th)}$	-1.5	-4.5	V	I_D=-1mA, V_{DS}= V_{GS}
Gate-Body Leakage	I_{GSS}		100	nA	V_{GS}=± 20V, V_{DS}=0V
Zero Gate Voltage Drain Current	I_{DSS}		-20 -2	µA mA	V_{DS}=-350 V, V_{GS}=0 V_{DS}=-280 V, V_{GS}=0V, T=125°C(2)
On-State Drain Current(1)	$I_{D(on)}$	-120		mA	V_{DS}=-25 V, V_{GS}=-10V
Static Drain-Source On-State Resistance (1)	$R_{DS(on)}$		100	Ω	V_{GS}=-10V,I_D=-50mA
Forward Transconductance (1)(2)	g_{fs}	40		mS	V_{DS}=-25V,I_D=-50mA
Input Capacitance (2)	C_{iss}		120	pF	V_{DS}=-25 V, V_{GS}=0V, f=1MHz
Common Source Output Capacitance (2)	C_{oss}		20	pF	
Reverse Transfer Capacitance (2)	C_{rss}		5	pF	
Turn-On Delay Time (2)(3)	$t_{d(on)}$		10	ns	V_{DD}≈-25V, I_D=-50mA
Rise Time (2)(3)	t_r		15	ns	
Turn-Off Delay Time (2)(3)	$t_{d(off)}$		15	ns	
Fall Time (2)(3)	t_f		20	ns	

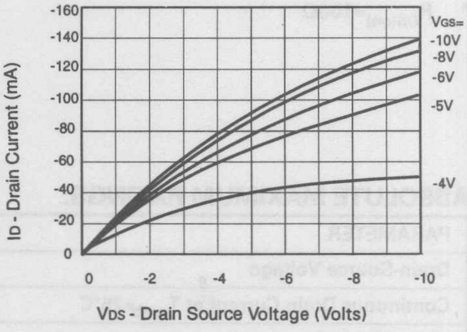
(1) Measured under pulsed conditions. Width=300µs. Duty cycle ≤2%
(2) Sample test.
(3) Switching times measured with 50Ω source impedance and <5ns rise time on a pulse generator

ZVP0535A

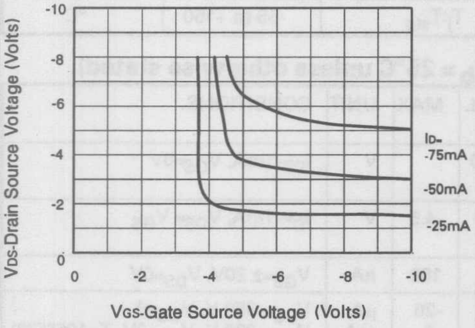
TYPICAL CHARACTERISTICS



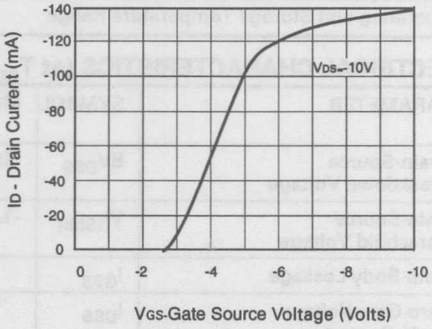
Output Characteristics



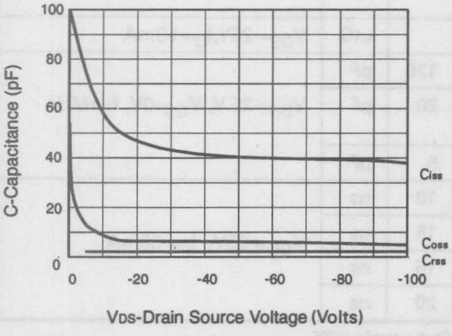
Saturation Characteristics



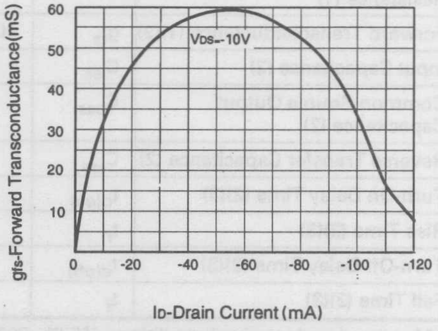
Voltage Saturation Characteristics



Transfer Characteristics

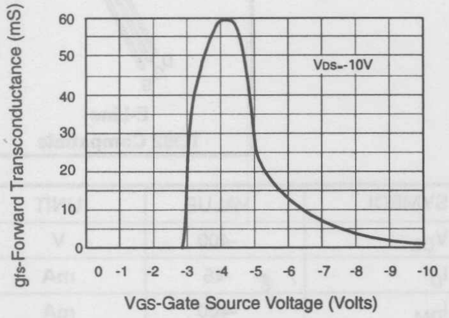


Capacitance v drain-source voltage

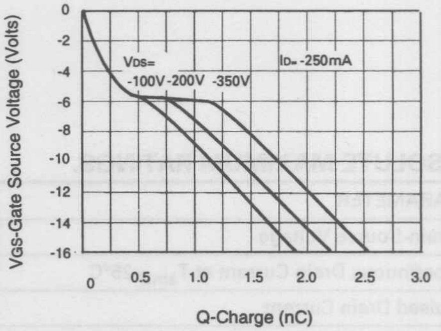


Transconductance v drain current

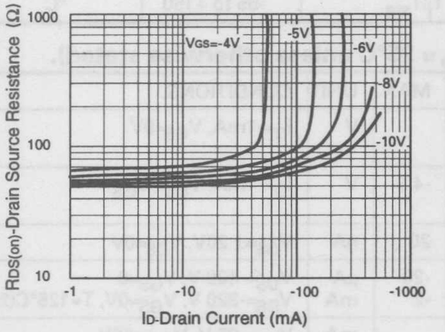
TYPICAL CHARACTERISTICS



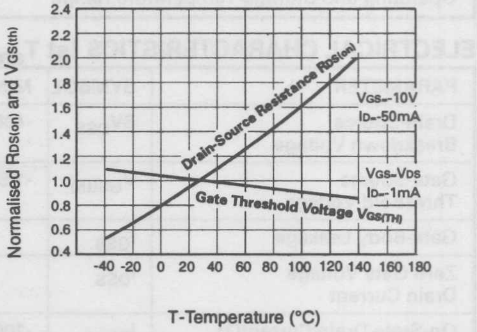
Transconductance v gate-source voltage



Gate charge v gate-source voltage



On-resistance v Gate-Source Voltage



Normalised RDS(on) and VGS(th) vs Temperature

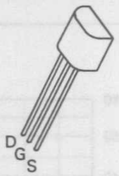
P-CHANNEL ENHANCEMENT MODE VERTICAL DMOS FET

ZVP0540A

ISSUE 2 – MARCH 94

FEATURES

- 400 Volt V_{DS}
- $R_{DS(on)}$=150Ω



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Drain-Source Voltage	V_{DS}	-400	V
Continuous Drain Current at T_{amb}=25°C	I_D	-45	mA
Pulsed Drain Current	I_{DM}	-400	mA
Gate Source Voltage	V_{GS}	± 20	V
Power Dissipation at T_{amb}=25°C	P_{tot}	700	mW
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +150	°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

PARAMETER	SYMBOL	MIN.	MAX.	UNIT	CONDITIONS.
Drain-Source Breakdown Voltage	BV_{DSS}	-400		V	I_D=-1mA, V_{GS}=0V
Gate-Source Threshold Voltage	$V_{GS(th)}$	-1.5	-4.5	V	I_D=-1mA, V_{DS}= V_{GS}
Gate-Body Leakage	I_{GSS}		20	nA	V_{GS}=± 20V, V_{DS}=0V
Zero Gate Voltage Drain Current	I_{DSS}		-20 -2	µA mA	V_{DS}=-400 V, V_{GS}=0 V_{DS}=-320 V, V_{GS}=0V, T=125°C(2)
On-State Drain Current(1)	$I_{D(on)}$	-100		mA	V_{DS}=-25 V, V_{GS}=-10V
Static Drain-Source On-State Resistance (1)	$R_{DS(on)}$		150	Ω	V_{GS}=-10V,I_D=-50mA
Forward Transconductance(1)(2)	g_{fs}	40		mS	V_{DS}=-25V,I_D=-50mA
Input Capacitance (2)	C_{iss}		120	pF	V_{DS}=-25 V, V_{GS}=0V, f=1MHz
Common Source Output Capacitance (2)	C_{oss}		20	pF	
Reverse Transfer Capacitance (2)	C_{rss}		5	pF	
Turn-On Delay Time (2)(3)	$t_{d(on)}$		10	ns	V_{DD}≈-25V, I_D=-50mA
Rise Time (2)(3)	t_r		15	ns	
Turn-Off Delay Time (2)(3)	$t_{d(off)}$		15	ns	
Fall Time (2)(3)	t_f		20	ns	

(1) Measured under pulsed conditions. Width=300µs. Duty cycle ≤2%
(2) Sample test.
(3) Switching times measured with 50Ω source impedance and <5ns rise time on a pulse generator

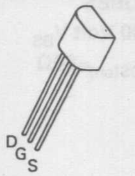
P-CHANNEL ENHANCEMENT MODE VERTICAL DMOS FET

ZVP0545A

ISSUE 2 – MARCH 94

FEATURES

- * 450 Volt V_{DS}
- * $R_{DS(on)}=150\Omega$



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Drain-Source Voltage	V_{DS}	-450	V
Continuous Drain Current at T_{amb}=25°C	I_D	-45	mA
Pulsed Drain Current	I_{DM}	-400	mA
Gate Source Voltage	V_{GS}	± 20	V
Power Dissipation at T_{amb}=25°C	P_{tot}	700	mW
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +150	°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

PARAMETER	SYMBOL	MIN.	MAX.	UNIT	CONDITIONS.
Drain-Source Breakdown Voltage	BV_{DSS}	-450		V	I_D=-1mA, V_{GS}=0V
Gate-Source Threshold Voltage	$V_{GS(th)}$	-1.5	-4.5	V	I_D=-1mA, V_{DS}= V_{GS}
Gate-Body Leakage	I_{GSS}		20	nA	V_{GS}=± 20V, V_{DS}=0V
Zero Gate Voltage Drain Current	I_{DSS}		-20 -2	µA mA	V_{DS}=-450 V, V_{GS}=0 V_{DS}=-360 V, V_{GS}=0V, T=125°C(2)
On-State Drain Current(1)	$I_{D(on)}$	-100		mA	V_{DS}=-25 V, V_{GS}=-10V
Static Drain-Source On-State Resistance (1)	$R_{DS(on)}$		150	Ω	V_{GS}=-10V,I_D=-50mA
Forward Transconductance (1)(2)	g_{fs}	40		mS	V_{DS}=-25V,I_D=-50mA
Input Capacitance (2)	C_{iss}		120	pF	V_{DS}=-25 V, V_{GS}=0V, f=1MHz
Common Source Output Capacitance (2)	C_{oss}		20	pF	
Reverse Transfer Capacitance (2)	C_{rss}		5	pF	
Turn-On Delay Time (2)(3)	$t_{d(on)}$		10	ns	V_{DD}≈-25V, I_D=-50mA
Rise Time (2)(3)	t_r		15	ns	
Turn-Off Delay Time (2)(3)	$t_{d(off)}$		15	ns	
Fall Time (2)(3)	t_f		20	ns	

(1) Measured under pulsed conditions. Width=300µs. Duty cycle ≤2%
(2) Sample test.
(3) Switching times measured with 50Ω source impedance and <5ns rise time on a pulse generator

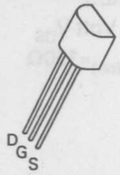
P-CHANNEL ENHANCEMENT MODE VERTICAL DMOS FET

ZVP1320A

ISSUE 2 – MARCH 94

FEATURES

- 200 Volt V_{DS}
- $R_{DS(on)}$=80Ω



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

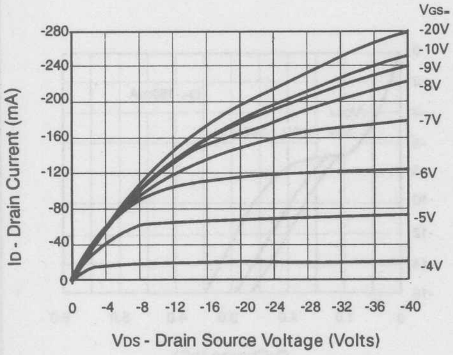
PARAMETER	SYMBOL	VALUE	UNIT
Drain-Source Voltage	V_{DS}	-200	V
Continuous Drain Current at T_{amb}=25°C	I_D	-70	mA
Pulsed Drain Current	I_{DM}	-400	mA
Gate Source Voltage	V_{GS}	± 20	V
Power Dissipation at T_{amb}=25°C	P_{tot}	625	mW
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +150	°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

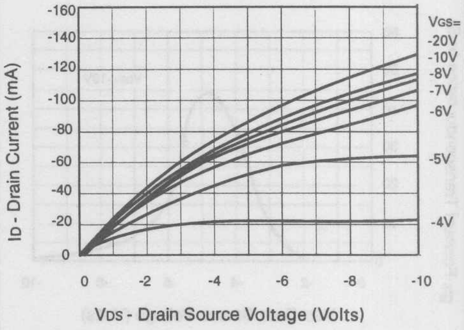
PARAMETER	SYMBOL	MIN.	MAX.	UNIT	CONDITIONS.
Drain-Source Breakdown Voltage	BV_{DSS}	-200		V	I_D=-1mA, V_{GS}=0V
Gate-Source Threshold Voltage	$V_{GS(th)}$	-1.5	-3.5	V	I_D=-1mA, V_{DS}= V_{GS}
Gate-Body Leakage	I_{GSS}		20	nA	V_{GS}=± 20V, V_{DS}=0V
Zero Gate Voltage Drain Current	I_{DSS}		-10 -50	µA µA	V_{DS}=-200 V, V_{GS}=0 V_{DS}=-160 V, V_{GS}=0V, T=125°C(2)
On-State Drain Current(1)	$I_{D(on)}$	-100		mA	V_{DS}=-25 V, V_{GS}=-10V
Static Drain-Source On-State Resistance (1)	$R_{DS(on)}$		80	Ω	V_{GS}=-10V,I_D=-50mA
Forward Transconductance (1)(2)	g_{fs}	25		mS	V_{DS}=-25V,I_D=-50mA
Input Capacitance (2)	C_{iss}		50	pF	V_{DS}=-25 V, V_{GS}=0V, f=1MHz
Common Source Output Capacitance (2)	C_{oss}		15	pF	
Reverse Transfer Capacitance (2)	C_{rss}		5	pF	
Turn-On Delay Time (2)(3)	$t_{d(on)}$		8	ns	V_{DD}≈-25V, I_D=-50mA
Rise Time (2)(3)	t_r		8	ns	
Turn-Off Delay Time (2)(3)	$t_{d(off)}$		8	ns	
Fall Time (2)(3)	t_f		16	ns	

(1) Measured under pulsed conditions. Width=300µs. Duty cycle ≤2%
(2) Sample test.
(3) Switching times measured with 50Ω source impedance and <5ns rise time on a pulse generator

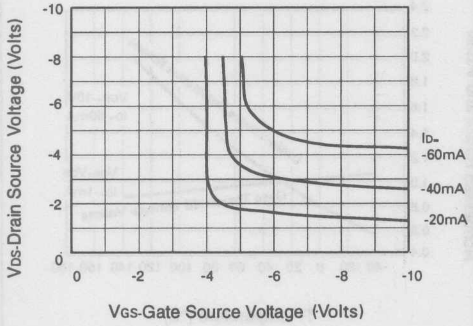
TYPICAL CHARACTERISTICS



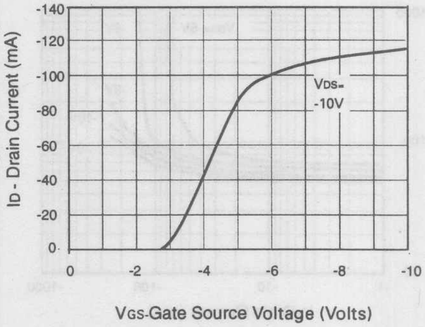
Output Characteristics



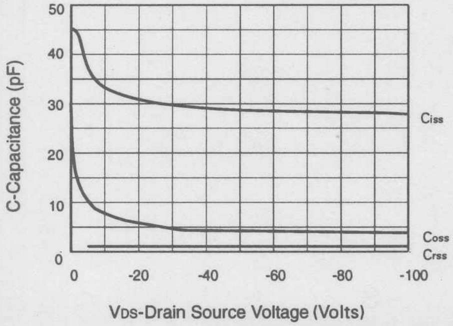
Saturation Characteristics



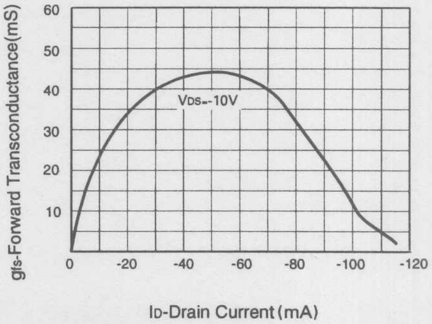
Voltage Saturation Characteristics



Transfer Characteristics



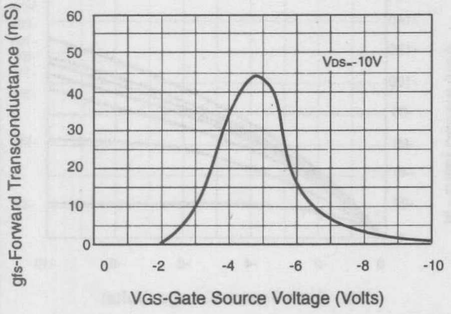
Capacitance v drain-source voltage



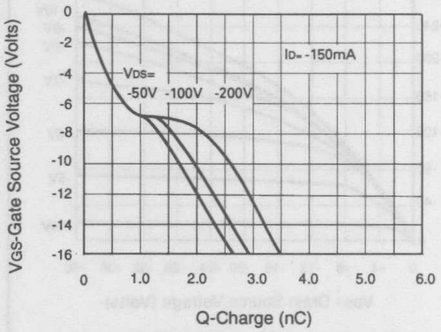
Transconductance v drain current

ZVP1320A

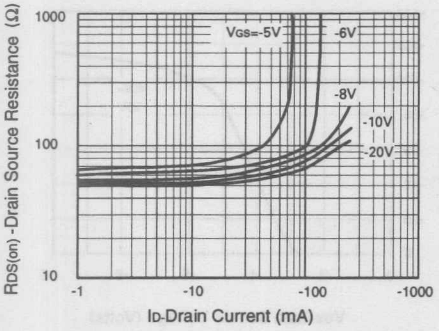
TYPICAL CHARACTERISTICS



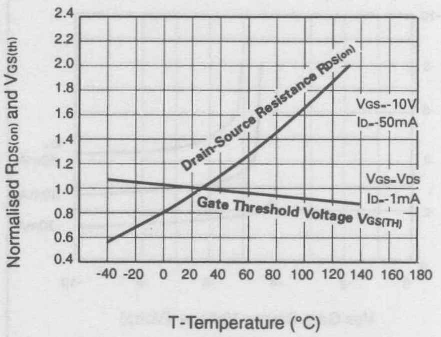
Transconductance v gate-source voltage



Gate charge v gate-source voltage



On-resistance v drain current



Normalised $R_{DS(on)}$ and $V_{GS(th)}$ vs Temperature

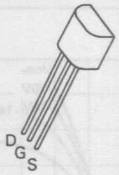
P-CHANNEL ENHANCEMENT MODE VERTICAL DMOS FET

ISSUE 2 – MARCH 94

ZVP2106A

FEATURES

- 60 Volt V_{DS}
- $R_{DS(on)}$=5Ω



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Drain-Source Voltage	V_{DS}	-60	V
Continuous Drain Current at T_{amb}=25°C	I_D	-280	mA
Pulsed Drain Current	I_{DM}	-4	A
Gate Source Voltage	V_{GS}	± 20	V
Power Dissipation at T_{amb}=25°C	P_{tot}	700	mW
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +150	°C

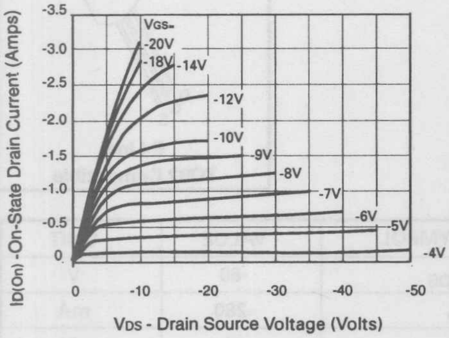
ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

PARAMETER	SYMBOL	MIN.	MAX.	UNIT	CONDITIONS.
Drain-Source Breakdown Voltage	BV_{DSS}	-60		V	I_D=-1mA, V_{GS}=0V
Gate-Source Threshold Voltage	$V_{GS(th)}$	-1.5	-3.5	V	I_D=-1mA, V_{DS}= V_{GS}
Gate-Body Leakage	I_{GSS}		20	nA	V_{GS}=± 20V, V_{DS}=0V
Zero Gate Voltage Drain Current	I_{DSS}		-0.5 -100	µA µA	V_{DS}=-60 V, V_{GS}=0 V_{DS}=-48 V, V_{GS}=0V, T=125°C(2)
On-State Drain Current(1)	$I_{D(on)}$	-1		A	V_{DS}=-18 V, V_{GS}=-10V
Static Drain-Source On-State Resistance (1)	$R_{DS(on)}$		5	Ω	V_{GS}=-10V,I_D=-500mA
Forward Transconductance (1)(2)	g_{fs}	150		mS	V_{DS}=-18V,I_D=-500mA
Input Capacitance (2)	C_{iss}		100	pF	V_{DS}=-18V, V_{GS}=0V, f=1MHz
Common Source Output Capacitance (2)	C_{oss}		60	pF	
Reverse Transfer Capacitance (2)	C_{rss}		20	pF	
Turn-On Delay Time (2)(3)	$t_{d(on)}$		7	ns	V_{DD}≈-18V, I_D=-500mA
Rise Time (2)(3)	t_r		15	ns	
Turn-Off Delay Time (2)(3)	$t_{d(off)}$		12	ns	
Fall Time (2)(3)	t_f		15	ns	

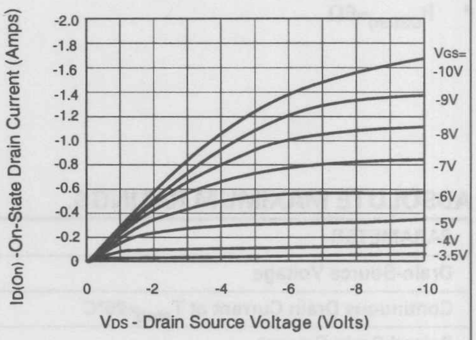
(1) Measured under pulsed conditions. Width=300µs. Duty cycle ≤2%
(2) Sample test.
(3) Switching times measured with 50Ω source impedance and <5ns rise time on a pulse generator

ZVP2106A

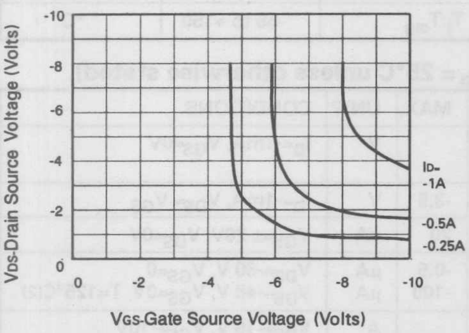
TYPICAL CHARACTERISTICS



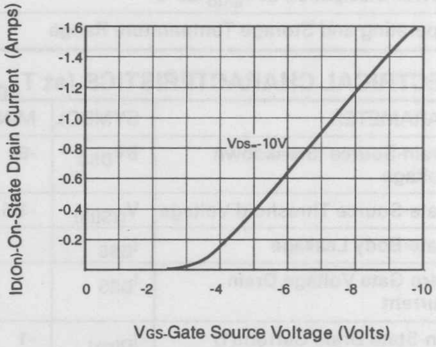
Output Characteristics



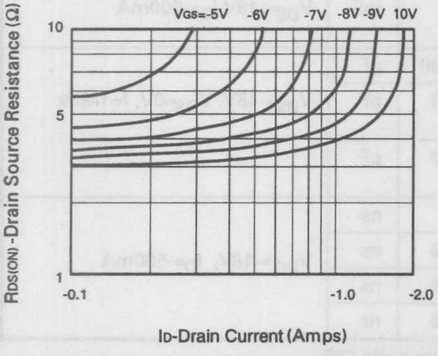
Saturation Characteristics



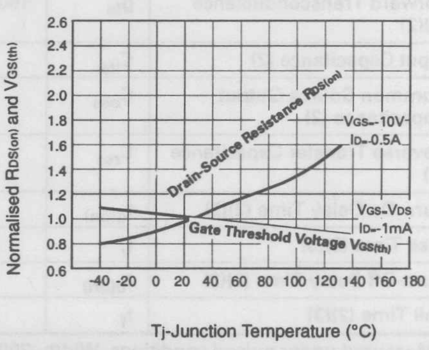
Voltage Saturation Characteristics



Transfer Characteristics

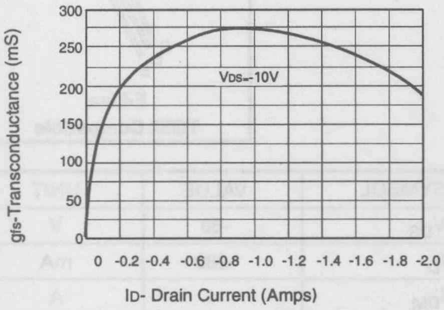


On-resistance v drain current

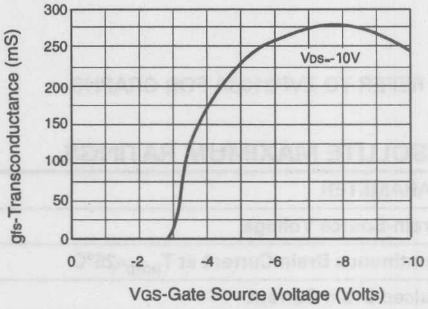


Normalised RDS(on) and VGS(th) vs Temperature

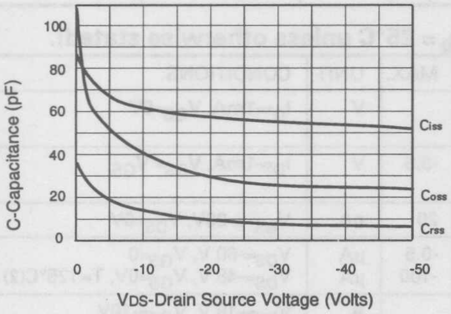
TYPICAL CHARACTERISTICS



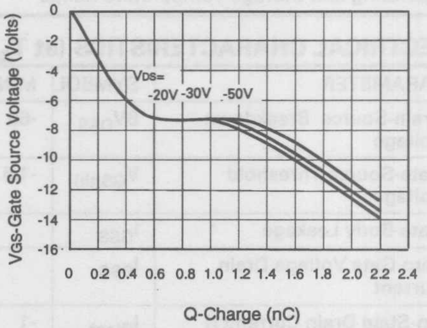
Transconductance v drain current



Transconductance v gate-source voltage



Capacitance v drain-source voltage



Gate charge v gate-source voltage

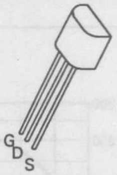
P-CHANNEL ENHANCEMENT MODE VERTICAL DMOS FET

ZVP2106C

ISSUE 2 – MARCH 94

FEATURES

- * 60 Volt V_{DS}
- * $R_{DS(on)}=5\Omega$



E-Line
TO92 Compatible

REFER TO ZVP2106A FOR GRAPHS

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Drain-Source Voltage	V_{DS}	-60	V
Continuous Drain Current at T_{amb}=25°C	I_D	-280	mA
Pulsed Drain Current	I_{DM}	-4	A
Gate Source Voltage	V_{GS}	± 20	V
Power Dissipation at T_{amb}=25°C	P_{tot}	700	mW
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +150	°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

PARAMETER	SYMBOL	MIN.	MAX.	UNIT	CONDITIONS.
Drain-Source Breakdown Voltage	BV_{DSS}	-60		V	I_D=-1mA, V_{GS}=0V
Gate-Source Threshold Voltage	$V_{GS(th)}$	-1.5	-3.5	V	I_D=-1mA, V_{DS}= V_{GS}
Gate-Body Leakage	I_{GSS}		20	nA	V_{GS}=± 20V, V_{DS}=0V
Zero Gate Voltage Drain Current	I_{DSS}		-0.5 -100	µA µA	V_{DS}=-60 V, V_{GS}=0 V_{DS}=-48 V, V_{GS}=0V, T=125°C(2)
On-State Drain Current(1)	$I_{D(on)}$	-1		A	V_{DS}=-18 V, V_{GS}=-10V
Static Drain-Source On-State Resistance (1)	$R_{DS(on)}$		5	Ω	V_{GS}=-10V,I_D=-500mA
Forward Transconductance (1)(2)	g_{fs}	150		mS	V_{DS}=-18V,I_D=-500mA
Input Capacitance (2)	C_{iss}		100	pF	V_{DS}=-18V, V_{GS}=0V, f=1MHz
Common Source Output Capacitance (2)	C_{oss}		60	pF	
Reverse Transfer Capacitance (2)	C_{rss}		20	pF	
Turn-On Delay Time (2)(3)	$t_{d(on)}$		7	ns	$V_{DD}\approx$-18V, I_D=-500mA
Rise Time (2)(3)	t_r		15	ns	
Turn-Off Delay Time (2)(3)	$t_{d(off)}$		12	ns	
Fall Time (2)(3)	t_f		15	ns	

(1) Measured under pulsed conditions. Width=300µs. Duty cycle ≤2% (2) Sample test.
(3) Switching times measured with 50Ω source impedance and <5ns rise time on a pulse generator

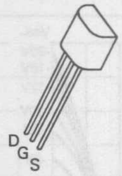
P-CHANNEL ENHANCEMENT MODE VERTICAL DMOS FET

ISSUE 2 – MARCH 94

ZVP2110A

FEATURES

- 100 Volt V_{DS}
- $R_{DS(on)}$=8Ω



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Drain-Source Voltage	V_{DS}	-100	V
Continuous Drain Current at T_{amb}=25°C	I_D	-230	mA
Pulsed Drain Current	I_{DM}	-3	A
Gate Source Voltage	V_{GS}	± 20	V
Power Dissipation at T_{amb}=25°C	P_{tot}	700	mW
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +150	°C

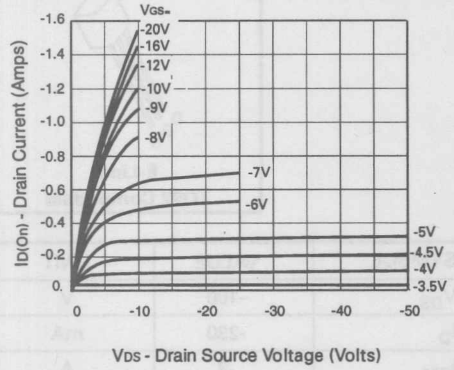
ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

PARAMETER	SYMBOL	MIN.	MAX.	UNIT	CONDITIONS.
Drain-Source Breakdown Voltage	BV_{DSS}	-100		V	I_D=-1mA, V_{GS}=0V
Gate-Source Threshold Voltage	$V_{GS(th)}$	-1.5	-3.5	V	I_D=-1mA, V_{DS}= V_{GS}
Gate-Body Leakage	I_{GSS}		20	nA	V_{GS}=± 20V, V_{DS}=0V
Zero Gate Voltage Drain Current	I_{DSS}		-1 -100	μA μA	V_{DS}=-100 V, V_{GS}=0 V_{DS}=-80 V, V_{GS}=0V, T=125°C(2)
On-State Drain Current(1)	$I_{D(on)}$	-750		mA	V_{DS}=-25 V, V_{GS}=-10V
Static Drain-Source On-State Resistance (1)	$R_{DS(on)}$		8	Ω	V_{GS}=-10V,I_D=-375mA
Forward Transconductance (1)(2)	g_{fs}	125		mS	V_{DS}=-25V,I_D=-375mA
Input Capacitance (2)	C_{iss}		100	pF	V_{DS}=-25V, V_{GS}=0V, f=1MHz
Common Source Output Capacitance (2)	C_{oss}		35	pF	
Reverse Transfer Capacitance (2)	C_{rss}		10	pF	
Turn-On Delay Time (2)(3)	$t_{d(on)}$		7	ns	V_{DD}≈-25V, I_D=-375mA
Rise Time (2)(3)	t_r		15	ns	
Turn-Off Delay Time (2)(3)	$t_{d(off)}$		12	ns	
Fall Time (2)(3)	t_f		15	ns	

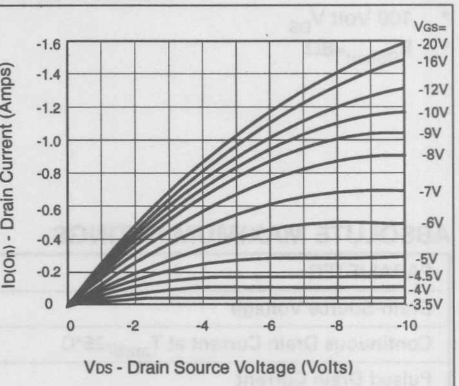
(1) Measured under pulsed conditions. Width=300μs. Duty cycle ≤2%
(2) Sample test.
(3) Switching times measured with 50Ω source impedance and <5ns rise time on a pulse generator

ZVP2110A

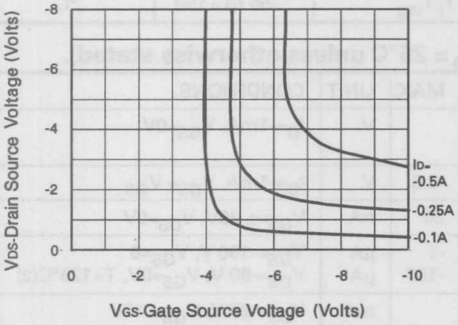
TYPICAL CHARACTERISTICS



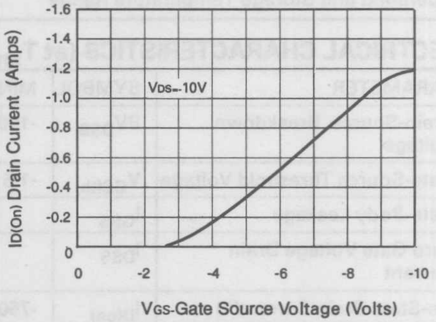
Output Characteristics



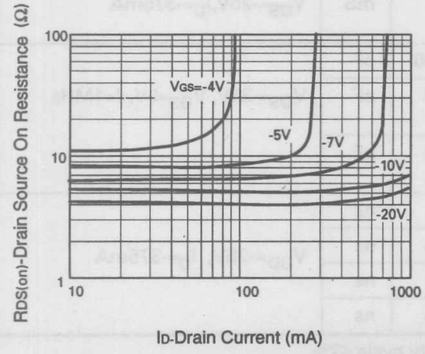
Saturation Characteristics



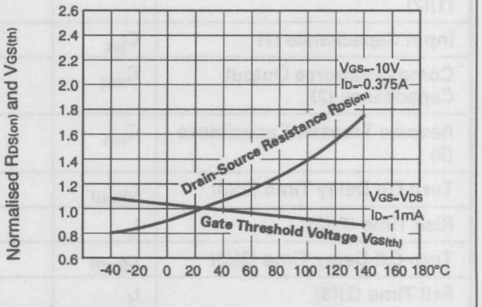
Voltage Saturation Characteristics



Transfer Characteristics



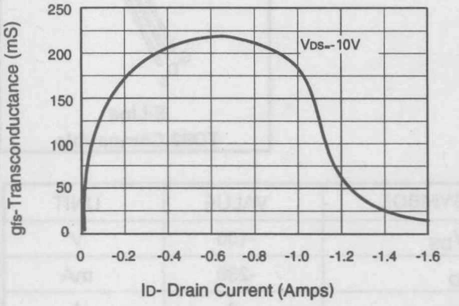
On-resistance v drain current



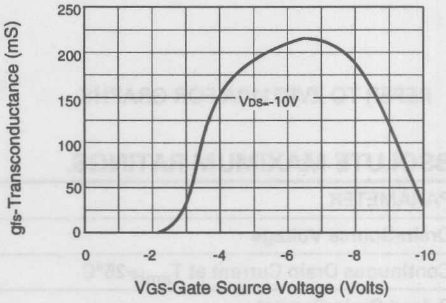
Normalised $R_{DS(on)}$ and $V_{GS(th)}$ vs Temperature

ZVP2110A

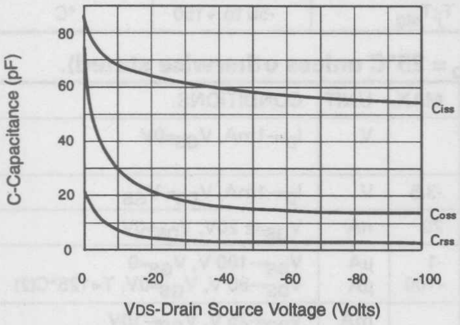
TYPICAL CHARACTERISTICS



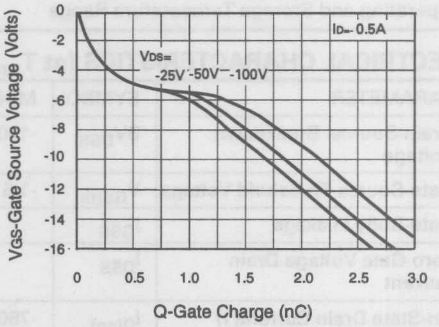
Transconductance v drain current



Transconductance v gate-source voltage



Capacitance v drain-source voltage



Gate charge v gate-source voltage

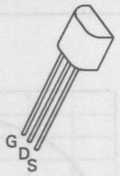
P-CHANNEL ENHANCEMENT MODE VERTICAL DMOS FET

ZVP2110C

ISSUE 2 – MARCH 94

FEATURES

- 100 Volt V_{DS}
- $R_{DS(on)}=8\Omega$



E-Line
TO92 Compatible

REFER TO ZVP2110A FOR GRAPHS

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Drain-Source Voltage	V_{DS}	-100	V
Continuous Drain Current at T_{amb}=25°C	I_D	-230	mA
Pulsed Drain Current	I_{DM}	-3	A
Gate Source Voltage	V_{GS}	± 20	V
Power Dissipation at T_{amb}=25°C	P_{tot}	700	mW
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +150	°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

PARAMETER	SYMBOL	MIN.	MAX.	UNIT	CONDITIONS.
Drain-Source Breakdown Voltage	BV_{DSS}	-100		V	I_D=-1mA, V_{GS}=0V
Gate-Source Threshold Voltage	$V_{GS(th)}$	-1.5	-3.5	V	I_D=-1mA, V_{DS}= V_{GS}
Gate-Body Leakage	I_{GSS}		20	nA	V_{GS}=± 20V, V_{DS}=0V
Zero Gate Voltage Drain Current	I_{DSS}		-1 -100	µA µA	V_{DS}=-100 V, V_{GS}=0 V_{DS}=-80 V, V_{GS}=0V, T=125°C(2)
On-State Drain Current(1)	$I_{D(on)}$	-750		mA	V_{DS}=-25 V, V_{GS}=-10V
Static Drain-Source On-State Resistance (1)	$R_{DS(on)}$		8	Ω	V_{GS}=-10V,I_D=-375mA
Forward Transconductance (1)(2)	g_{fs}	125		mS	V_{DS}=-25V,I_D=-375mA
Input Capacitance (2)	C_{iss}		100	pF	V_{DS}=-25V, V_{GS}=0V, f=1MHz
Common Source Output Capacitance (2)	C_{oss}		35	pF	
Reverse Transfer Capacitance (2)	C_{rss}		10	pF	
Turn-On Delay Time (2)(3)	$t_{d(on)}$		7	ns	V_{DD}≈-25V, I_D=-375mA
Rise Time (2)(3)	t_r		15	ns	
Turn-Off Delay Time (2)(3)	$t_{d(off)}$		12	ns	
Fall Time (2)(3)	t_f		15	ns	

(1) Measured under pulsed conditions. Width=300µs. Duty cycle ≤2%
(2) Sample test.
(3) Switching times measured with 50Ω source impedance and <5ns rise time on a pulse generator

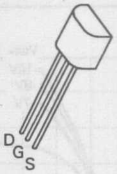
P-CHANNEL ENHANCEMENT MODE VERTICAL DMOS FET

ZVP2120A

ISSUE 2 – MARCH 94

FEATURES

- 200 Volt V_{DS}
- $R_{DS(on)}=25\Omega$



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Drain-Source Voltage	V_{DS}	-200	V
Continuous Drain Current at T_{amb}=25°C	I_D	-120	mA
Pulsed Drain Current	I_{DM}	-1.2	A
Gate Source Voltage	V_{GS}	± 20	V
Power Dissipation at T_{amb}=25°C	P_{tot}	700	mW
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +150	°C

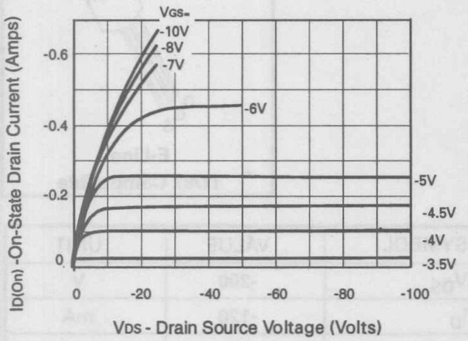
ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

PARAMETER	SYMBOL	MIN.	MAX.	UNIT	CONDITIONS.
Drain-Source Breakdown Voltage	BV_{DSS}	-200		V	I_D=-1mA, V_{GS}=0V
Gate-Source Threshold Voltage	$V_{GS(th)}$	-1.5	-3.5	V	I_D=-1mA, V_{DS}= V_{GS}
Gate-Body Leakage	I_{GSS}		20	nA	V_{GS}=± 20V, V_{DS}=0V
Zero Gate Voltage Drain Current	I_{DSS}		-10 -100	µA µA	V_{DS}=-200 V, V_{GS}=0 V_{DS}=-160 V, V_{GS}=0V, T=125°C(2)
On-State Drain Current(1)	$I_{D(on)}$	-300		mA	V_{DS}=-25 V, V_{GS}=-10V
Static Drain-Source On-State Resistance (1)	$R_{DS(on)}$		25	Ω	V_{GS}=-10V,I_D=-150mA
Forward Transconductance (1)(2)	g_{fs}	50		mS	V_{DS}=-25V,I_D=-150mA
Input Capacitance (2)	C_{iss}		100	pF	V_{DS}=-25V, V_{GS}=0V, f=1MHz
Common Source Output Capacitance (2)	C_{oss}		25	pF	
Reverse Transfer Capacitance (2)	C_{rss}		7	pF	
Turn-On Delay Time (2)(3)	$t_{d(on)}$		7	ns	$V_{DD}\approx$-25V, I_D=-150mA
Rise Time (2)(3)	t_r		15	ns	
Turn-Off Delay Time (2)(3)	$t_{d(off)}$		12	ns	
Fall Time (2)(3)	t_f		15	ns	

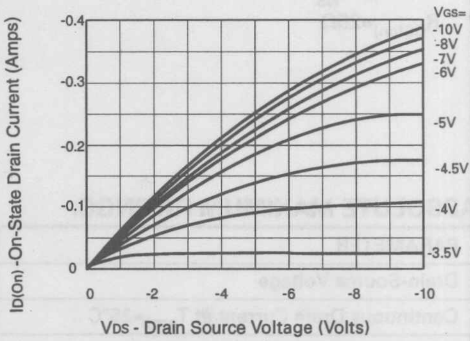
(1) Measured under pulsed conditions. Width=300µs. Duty cycle ≤2%
(2) Sample test.
(3) Switching times measured with 50Ω source impedance and <5ns rise time on a pulse generator

ZVP2120A

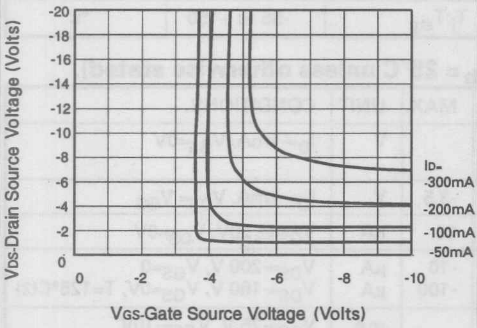
TYPICAL CHARACTERISTICS



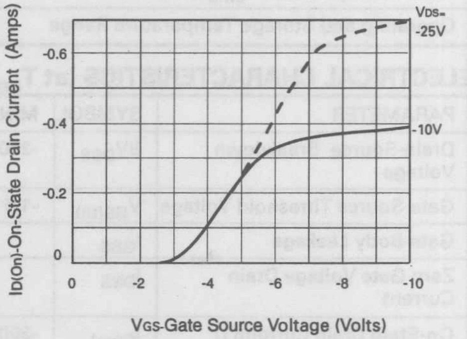
Output Characteristics



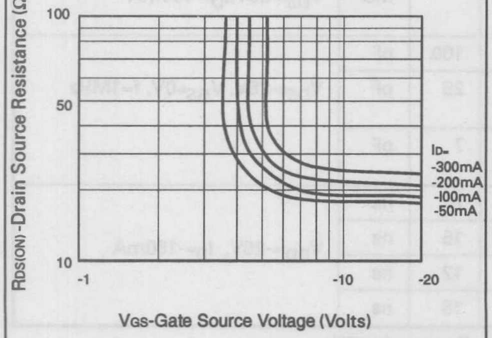
Saturation Characteristics



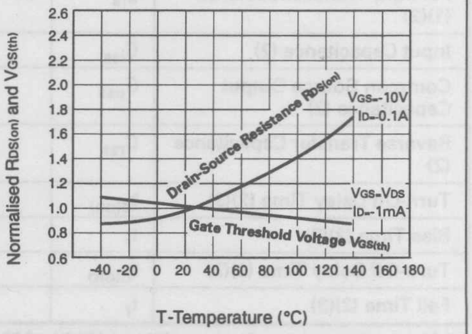
Voltage Saturation Characteristics



Transfer Characteristics

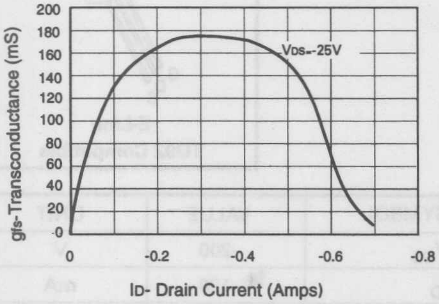


On-resistance vs gate-source voltage

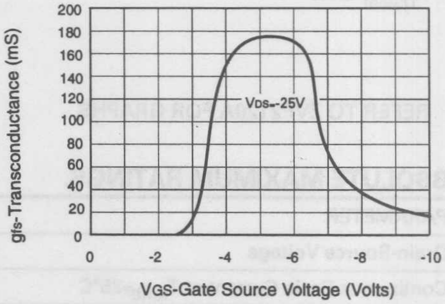


Normalised RDS(on) and VGS(th) vs Temperature

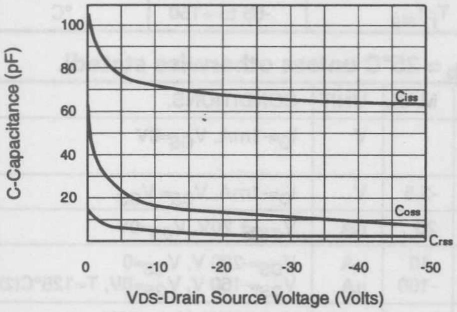
TYPICAL CHARACTERISTICS



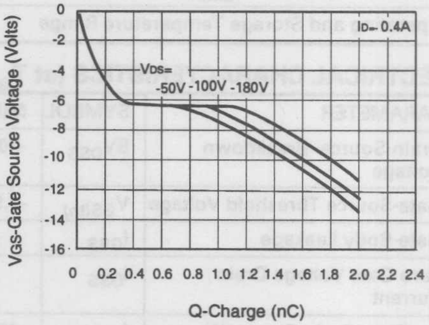
Transconductance v drain current



Transconductance v gate-source voltage



Capacitance v drain-source voltage

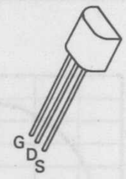


Gate charge v gate-source voltage

FEATURES

- * 200 Volt V_{DS}
- * $R_{DS(on)}$=25Ω

REFER TO ZVP2120A FOR GRAPHS



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Drain-Source Voltage	V_{DS}	-200	V
Continuous Drain Current at T_{amb}=25°C	I_D	-120	mA
Pulsed Drain Current	I_{DM}	-1.2	A
Gate Source Voltage	V_{GS}	± 20	V
Power Dissipation at T_{amb}=25°C	P_{tot}	700	mW
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +150	°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

PARAMETER	SYMBOL	MIN.	MAX.	UNIT	CONDITIONS.
Drain-Source Breakdown Voltage	BV_{DSS}	-200		V	I_D=-1mA, V_{GS}=0V
Gate-Source Threshold Voltage	$V_{GS(th)}$	-1.5	-3.5	V	I_D=-1mA, V_{DS}= V_{GS}
Gate-Body Leakage	I_{GSS}		20	nA	V_{GS}=± 20V, V_{DS}=0V
Zero Gate Voltage Drain Current	I_{DSS}		-10 -100	µA µA	V_{DS}=-200 V, V_{GS}=0 V_{DS}=-160 V, V_{GS}=0V, T=125°C(2)
On-State Drain Current(1)	$I_{D(on)}$	-300		mA	V_{DS}=-25 V, V_{GS}=-10V
Static Drain-Source On-State Resistance (1)	$R_{DS(on)}$		25	Ω	V_{GS}=-10V,I_D=-150mA
Forward Transconductance (1)(2)	g_{fs}	50		mS	V_{DS}=-25V,I_D=-150mA
Input Capacitance (2)	C_{iss}		100	pF	V_{DS}=-25V, V_{GS}=0V, f=1MHz
Common Source Output Capacitance (2)	C_{oss}		25	pF	
Reverse Transfer Capacitance (2)	C_{rss}		7	pF	
Turn-On Delay Time (2)(3)	$t_{d(on)}$		7	ns	V_{DD}≈-25V, I_D=-150mA
Rise Time (2)(3)	t_r		15	ns	
Turn-Off Delay Time (2)(3)	$t_{d(off)}$		12	ns	
Fall Time (2)(3)	t_f		15	ns	

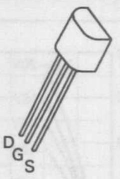
(1) Measured under pulsed conditions. Width=300µs. Duty cycle ≤2%
(2) Sample test.
(3) Switching times measured with 50Ω source impedance and <5ns rise time on a pulse generator

P-CHANNEL ENHANCEMENT MODE VERTICAL DMOS FET

ZVP3306A

ISSUE 2 – MARCH 94

FEATURES
- 60 Volt V_{DS}
- $R_{DS(on)}=14\Omega$



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

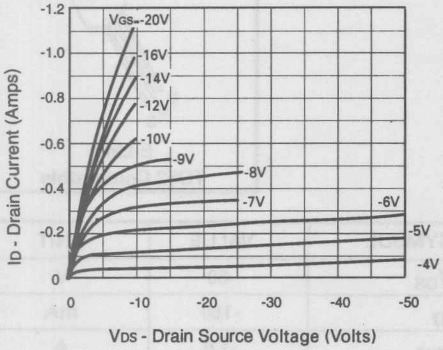
PARAMETER	SYMBOL	VALUE	UNIT
Drain-Source Voltage	V_{DS}	-60	V
Continuous Drain Current at T_{amb}=25°C	I_D	-160	mA
Pulsed Drain Current	I_{DM}	-1.6	A
Gate Source Voltage	V_{GS}	± 20	V
Power Dissipation at T_{amb}=25°C	P_{tot}	625	mW
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +150	°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

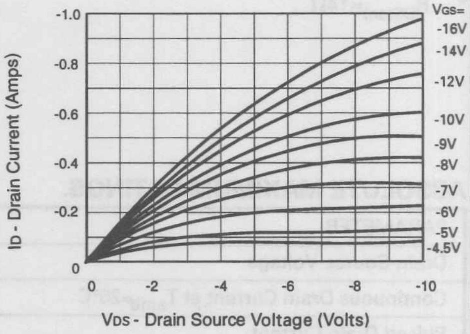
PARAMETER	SYMBOL	MIN.	MAX.	UNIT	CONDITIONS.
Drain-Source Breakdown Voltage	BV_{DSS}	-60		V	I_D=-1mA, V_{GS}=0V
Gate-Source Threshold Voltage	$V_{GS(th)}$	-1.5	-3.5	V	I_D=-1mA, V_{DS}= V_{GS}
Gate-Body Leakage	I_{GSS}		20	nA	V_{GS}=± 20V, V_{DS}=0V
Zero Gate Voltage Drain Current	I_{DSS}		-0.5 -50	µA µA	V_{DS}=-60 V, V_{GS}=0 V_{DS}=-48 V, V_{GS}=0V, T=125°C(2)
On-State Drain Current(1)	$I_{D(on)}$	-400		mA	V_{DS}=-18 V, V_{GS}=-10V
Static Drain-Source On-State Resistance (1)	$R_{DS(on)}$		14	Ω	V_{GS}=-10V,I_D=-200mA
Forward Transconductance (1)(2)	g_{fs}	60		mS	V_{DS}=-18V,I_D=-200mA
Input Capacitance (2)	C_{iss}		50	pF	V_{DS}=-18V, V_{GS}=0V, f=1MHz
Common Source Output Capacitance (2)	C_{oss}		25	pF	
Reverse Transfer Capacitance (2)	C_{rss}		8	pF	
Turn-On Delay Time (2)(3)	$t_{d(on)}$		8	ns	$V_{DD}\approx$-18V, I_D=-200mA
Rise Time (2)(3)	t_r		8	ns	
Turn-Off Delay Time (2)(3)	$t_{d(off)}$		8	ns	
Fall Time (2)(3)	t_f		8	ns	

(1) Measured under pulsed conditions. Width=300µs. Duty cycle ≤2%
(2) Sample test.
(3) Switching times measured with 50Ω source impedance and <5ns rise time on a pulse generator

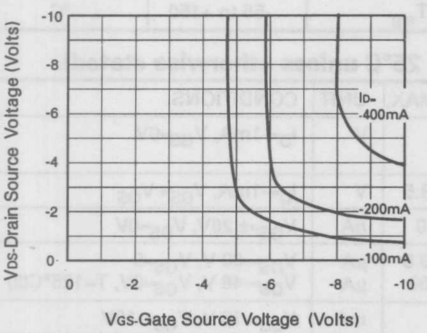
TYPICAL CHARACTERISTICS



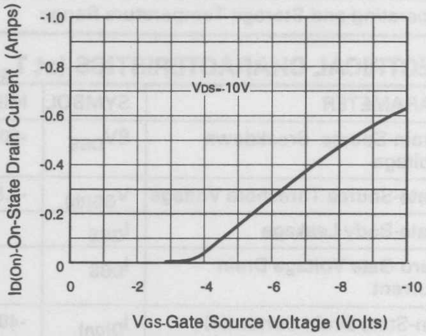
Output Characteristics



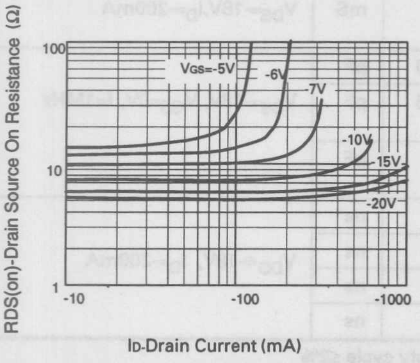
Saturation Characteristics



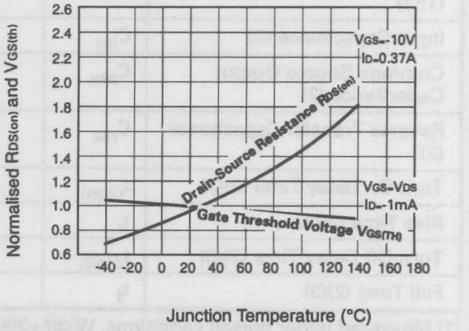
Voltage Saturation Characteristics



Transfer Characteristics

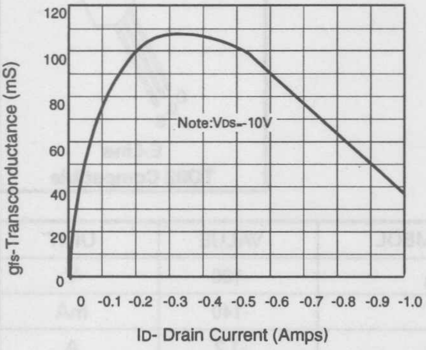


On-resistance vs Drain Current

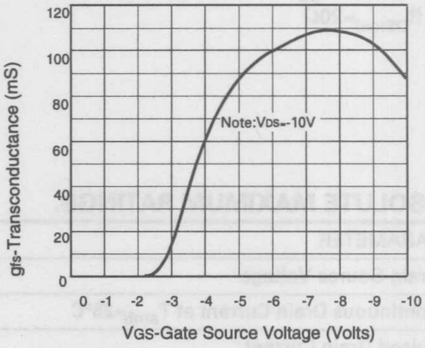


Normalised RDS(on) and VGS(th) vs Temperature

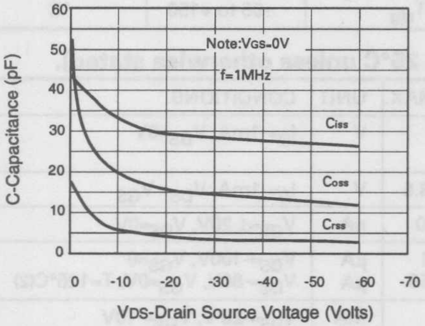
TYPICAL CHARACTERISTICS



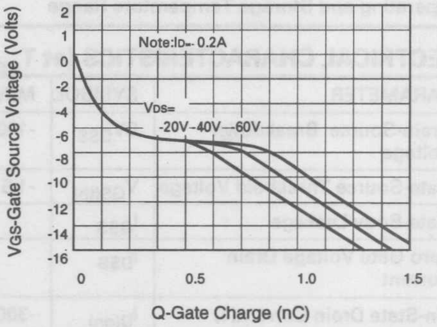
Transconductance v drain current



Transconductance v gate-source voltage



Capacitance v drain-source voltage



Gate charge v gate-source voltage

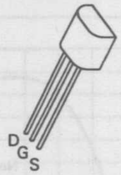
P-CHANNEL ENHANCEMENT MODE VERTICAL DMOS FET

ISSUE 2 – MARCH 94

ZVP3310A

FEATURES

- 100 Volt V_{DS}
- $R_{DS(on)}$=20Ω



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

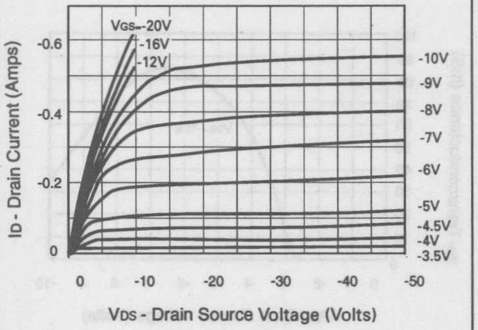
PARAMETER	SYMBOL	VALUE	UNIT
Drain-Source Voltage	V_{DS}	-100	V
Continuous Drain Current at T_{amb}=25°C	I_D	-140	mA
Pulsed Drain Current	I_{DM}	-1.2	A
Gate Source Voltage	V_{GS}	± 20	V
Power Dissipation at T_{amb}=25°C	P_{tot}	625	mW
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +150	°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

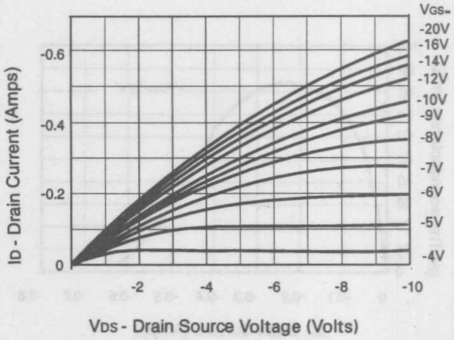
PARAMETER	SYMBOL	MIN.	MAX.	UNIT	CONDITIONS.
Drain-Source Breakdown Voltage	BV_{DSS}	-100		V	I_D=-1mA, V_{GS}=0V
Gate-Source Threshold Voltage	$V_{GS(th)}$	-1.5	-3.5	V	I_D=-1mA, V_{DS}= V_{GS}
Gate-Body Leakage	I_{GSS}		20	nA	V_{GS}=± 20V, V_{DS}=0V
Zero Gate Voltage Drain Current	I_{DSS}		-1 -50	µA µA	V_{DS}=-100V, V_{GS}=0 V_{DS}=-80V, V_{GS}=0V, T=125°C(2)
On-State Drain Current(1)	$I_{D(on)}$	-300		mA	V_{DS}=-25 V, V_{GS}=-10V
Static Drain-Source On-State Resistance (1)	$R_{DS(on)}$		20	Ω	V_{GS}=-10V,I_D=-150mA
Forward Transconductance (1)(2)	g_{fs}	50		mS	V_{DS}=-25V,I_D=-150mA
Input Capacitance (2)	C_{iss}		50	pF	V_{DS}=-25V, V_{GS}=0V, f=1MHz
Common Source Output Capacitance (2)	C_{oss}		15	pF	
Reverse Transfer Capacitance (2)	C_{rss}		5	pF	
Turn-On Delay Time (2)(3)	$t_{d(on)}$		8	ns	V_{DD}≈-25V, I_D=-150mA
Rise Time (2)(3)	t_r		8	ns	
Turn-Off Delay Time (2)(3)	$t_{d(off)}$		8	ns	
Fall Time (2)(3)	t_f		8	ns	

(1) Measured under pulsed conditions. Width=300µs. Duty cycle ≤2%
(2) Sample test.
(3) Switching times measured with 50Ω source impedance and <5ns rise time on a pulse generator

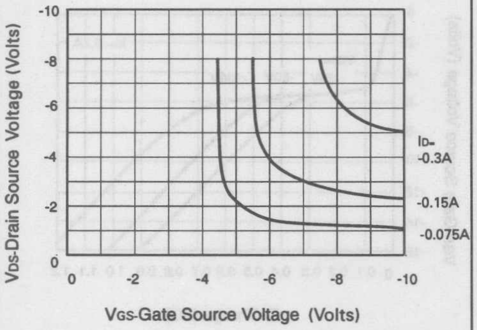
TYPICAL CHARACTERISTICS



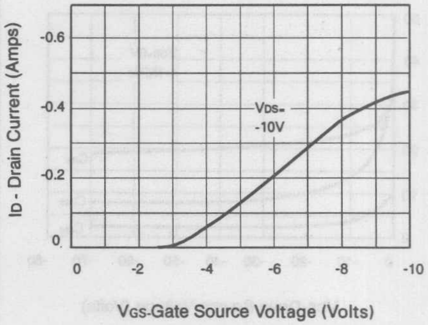
Output Characteristics



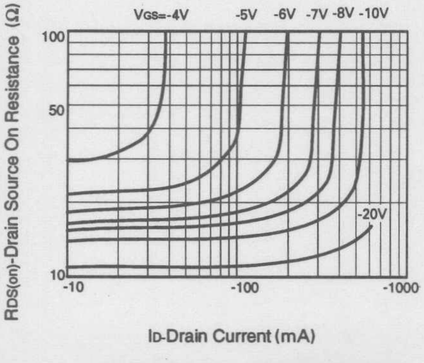
Saturation Characteristics



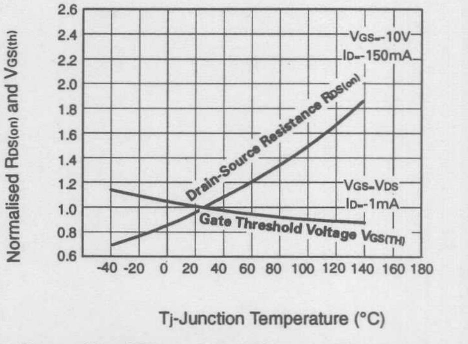
Voltage Saturation Characteristics



Transfer Characteristics

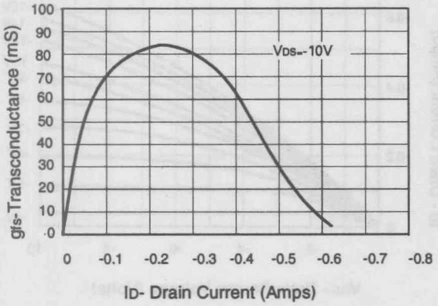


On-resistance v drain current

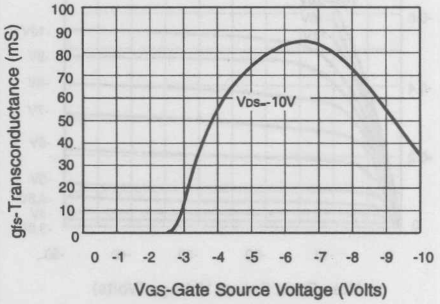


Normalised $R_{DS(on)}$ and $V_{GS(th)}$ v Temperature

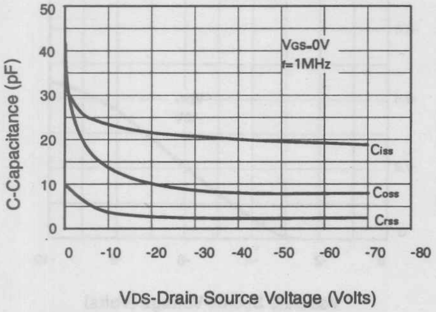
TYPICAL CHARACTERISTICS



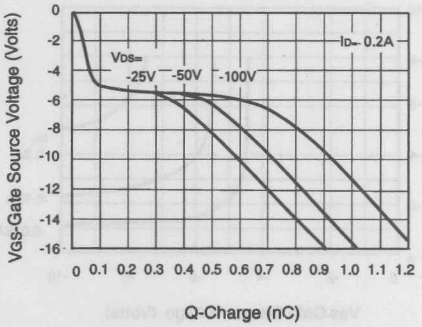
Transconductance v drain current



Transconductance v gate-source voltage



Capacitance v drain-source voltage



Gate charge v gate-source voltage

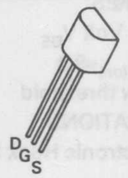
P-CHANNEL ENHANCEMENT MODE VERTICAL DMOS FET

ZVP4105A

ISSUE 2 – MARCH 94

FEATURES

- 50 Volt V_{DS}
- $R_{DS(on)}=10\Omega$
- Low threshold



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Drain-Source Voltage	V_{DS}	-50	V
Continuous Drain Current at $T_{amb}=25°C$	I_D	-175	mA
Pulsed Drain Current	I_{DM}	-520	mA
Gate Source Voltage	V_{GS}	± 20	V
Power Dissipation at $T_{amb}=25°C$	P_{tot}	625	mW
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +150	°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

PARAMETER	SYMBOL	MIN.	MAX.	UNIT	CONDITIONS.
Drain-Source Breakdown Voltage	BV_{DSS}	-50		V	I_D=-0.25mA, V_{GS}=0V
Gate-Source Threshold Voltage	$V_{GS(th)}$	-0.8	-2.0	V	I_D=-1mA, V_{DS}= V_{GS}
Gate-Body Leakage	I_{GSS}		10	nA	V_{GS}=± 20V, V_{DS}=0V
Zero Gate Voltage Drain Current	I_{DSS}		-15 -60 -100	µA µA nA	V_{DS}=-50V, V_{GS}=0V V_{DS}=-50V, V_{GS}=0V, T=125°C(2) V_{DS}=-25V, V_{GS}=0V
Static Drain-Source On-State Resistance (1)	$R_{DS(on)}$		10	Ω	V_{GS}=-5V,I_D=-100mA
Forward Transconductance (1)(2)	g_{fs}	50		mS	V_{DS}=-25V,I_D=-100mA
Input Capacitance (2)(4)	C_{iss}		40	pF	V_{DS}=-25V, V_{GS}=0V, f=1MHz
Common Source Output Capacitance (2)(4)	C_{oss}		15	pF	
Reverse Transfer Capacitance (2)(4)	C_{rss}		6	pF	
Turn-On Delay Time (2)(3)(4)	$t_{d(on)}$		10	ns	$V_{DD}\approx$-30V, I_D=-270mA
Rise Time (2)(3)(4)	t_r		10	ns	
Turn-Off Delay Time (2)(3)(4)	$t_{d(off)}$		18	ns	
Fall Time (2)(3)(4)	t_f		25	ns	

(1) Measured under pulsed conditions. Width=300µs. Duty cycle ≤2%
(2) Sample test.
(3) Switching times measured with 50Ω source impedance and <5ns rise time on a pulse generator
(4) Typical values

P-CHANNEL ENHANCEMENT MODE VERTICAL DMOS FET

ZVP4424A

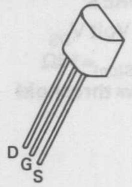
ISSUE 2 – SEPTEMBER 94

FEATURES

- 240 Volt V_{DS}
- $R_{DS(on)}$=9Ω
- Low threshold

APPLICATIONS

- Electronic Hook Switch



E-Line
TO92 Compatible

ABSOLUTE MAXIMUM RATINGS.

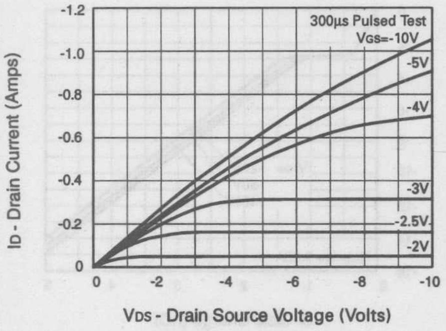
PARAMETER	SYMBOL	VALUE	UNIT
Drain-Source Voltage	V_{DS}	-240	V
Continuous Drain Current at T_{amb}=25°C	I_D	-200	mA
Pulsed Drain Current	I_{DM}	-1	A
Gate Source Voltage	V_{GS}	± 40	V
Power Dissipation at T_{amb}=25°C	P_{tot}	750	mW
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +150	°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

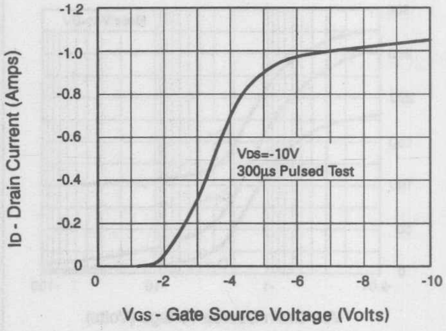
PARAMETER	SYMBOL	MIN.	TYP	MAX.	UNIT	CONDITIONS.
Drain-Source Breakdown Voltage	BV_{DSS}	-240			V	I_D=-1mA, V_{GS}=0V
Gate-Source Threshold Voltage	$V_{GS(th)}$	-0.7	-1.4	-2.0	V	I_D=-1mA, V_{DS}= V_{GS}
Gate-Body Leakage	I_{GSS}			100	nA	V_{GS}=± 40V, V_{DS}=0V
Zero Gate Voltage Drain Current	I_{DSS}			-10 -100	µA µA	V_{DS}=-240 V, V_{GS}=0 V_{DS}=-190V, V_{GS}=0V, T=125°C
On-State Drain Current	$I_{D(on)}$	-0.75	-1.0		A	V_{DS}=-10 V, V_{GS}=-10V
Static Drain-Source On-State Resistance	$R_{DS(on)}$		7.1 8.8	9 11	Ω Ω	V_{GS}=-10V,I_D=-200mA V_{GS}=-3.5V,I_D=-100mA
Forward Transconductance (1) (2)	g_{fs}	125			mS	V_{DS}=-10V,I_D=-0.2A
Input Capacitance (2)	C_{iss}		100	200	pF	V_{DS}=-25V, V_{GS}=0V, f=1MHz
Common Source Output Capacitance (2)	C_{oss}		18	25	pF	
Reverse Transfer Capacitance (2)	C_{rss}		5	15	pF	
Turn-On Delay Time (2)(3)	$t_{d(on)}$		8	15	ns	V_{DD} ≈-50V, I_D=-0.25A, V_{GEN}=-10V
Rise Time (2)(3)	t_r		8	15	ns	
Turn-Off Delay Time (2)(3)	$t_{d(off)}$		26	40	ns	
Fall Time (2)(3)	t_f		20	30	ns	

(1) Measured under pulsed conditions. Width=300µs. Duty cycle ≤2% (2) Sample test.
(3) Switching times measured with 50Ω source impedance and <5ns rise time on a pulse generator

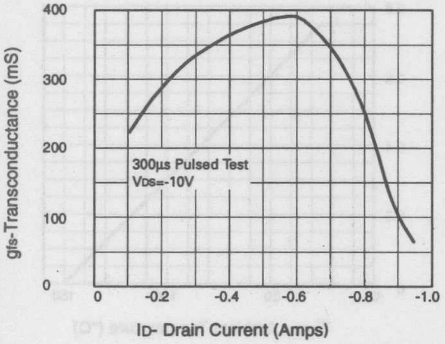
TYPICAL CHARACTERISTICS



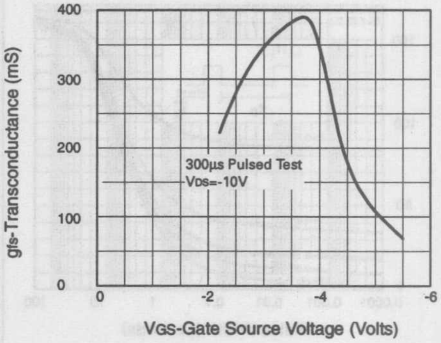
Saturation Characteristics



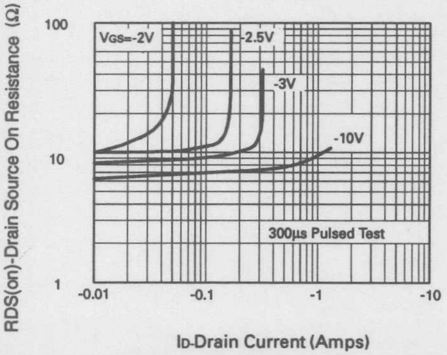
Transfer Characteristics



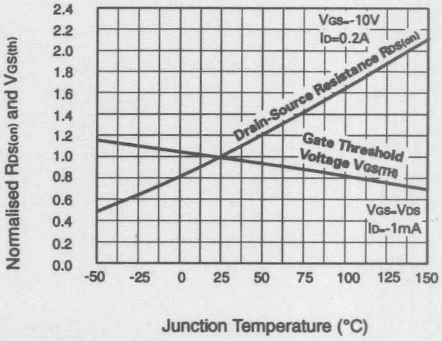
Transconductance v drain current



Transconductance v gate-source voltage

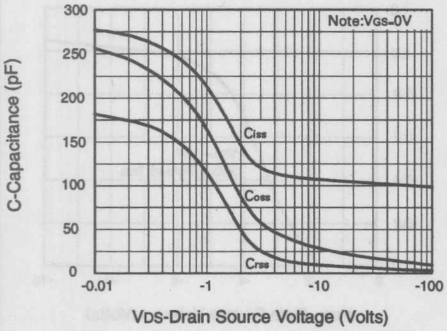


On-resistance vs Drain Current

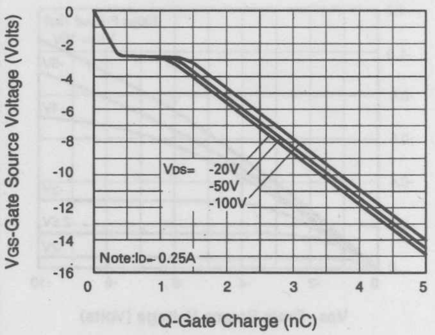


Normalised RDS(on) and VGS(th) vs Temperature

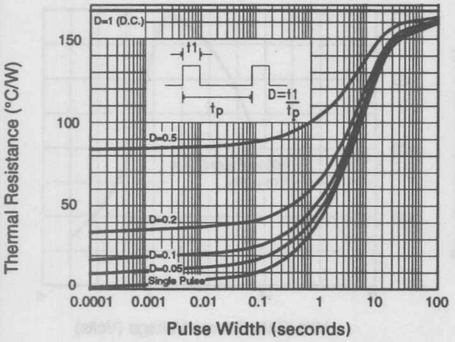
TYPICAL CHARACTERISTICS



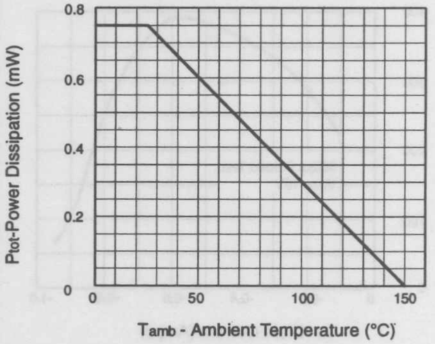
Capacitance v drain-source voltage



Gate charge v gate-source voltage



Maximum transient thermal impedance



Derating Curve

P-CHANNEL ENHANCEMENT MODE VERTICAL DMOS FET

ISSUE 2 – SEPTEMBER 94

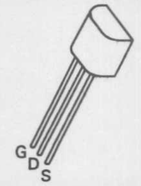
ZVP4424C

FEATURES

- 240 Volt V_{DS}
- $R_{DS(on)}=9\Omega$
- Low threshold

APPLICATIONS

- Electronic Hook Switch



E-Line
TO92 Compatible

REFER TO ZVP4424A FOR GRAPHS

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Drain-Source Voltage	V_{DS}	-240	V
Continuous Drain Current at T_{amb}=25°C	I_D	-200	mA
Pulsed Drain Current	I_{DM}	-1	A
Gate Source Voltage	V_{GS}	± 40	V
Power Dissipation at T_{amb}=25°C	P_{tot}	750	mW
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +150	°C

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

PARAMETER	SYMBOL	MIN.	TYP	MAX.	UNIT	CONDITIONS.
Drain-Source Breakdown Voltage	BV_{DSS}	-240			V	I_D=-1mA, V_{GS}=0V
Gate-Source Threshold Voltage	$V_{GS(th)}$	-0.7	-1.4	-2.0	V	I_D=-1mA, V_{DS}= V_{GS}
Gate-Body Leakage	I_{GSS}			100	nA	V_{GS}=± 40V, V_{DS}=0V
Zero Gate Voltage Drain Current	I_{DSS}			-10 -100	µA µA	V_{DS}=-240 V, V_{GS}=0 V_{DS}=-190V, V_{GS}=0V, T=125°C
On-State Drain Current	$I_{D(on)}$	-0.75	-1.0		A	V_{DS}=-10 V, V_{GS}=-10V
Static Drain-Source On-State Resistance	$R_{DS(on)}$		7.1 8.8	9 11	Ω Ω	V_{GS}=-10V,I_D=-200mA V_{GS}=-3.5V,I_D=-100mA
Forward Transconductance (1) (2)	g_{fs}	125			mS	V_{DS}=-10V,I_D=-0.2A
Input Capacitance (2)	C_{iss}		100	200	pF	V_{DS}=-25V, V_{GS}=0V, f=1MHz
Common Source Output Capacitance (2)	C_{oss}		18	25	pF	
Reverse Transfer Capacitance (2)	C_{rss}		5	15	pF	
Turn-On Delay Time (2)(3)	$t_{d(on)}$		8	15	ns	V_{DD}≈-50V, I_D=-0.25A, V_{GEN}=-10V
Rise Time (2)(3)	t_r		8	15	ns	
Turn-Off Delay Time (2)(3)	$t_{d(off)}$		26	40	ns	
Fall Time (2)(3)	t_f		20	30	ns	

(1) Measured under pulsed conditions. Width=300µs. Duty cycle ≤2% (2) Sample test.
(3) Switching times measured with 50Ω source impedance and <5ns rise time on a pulse generator

Package Outline Dimensions

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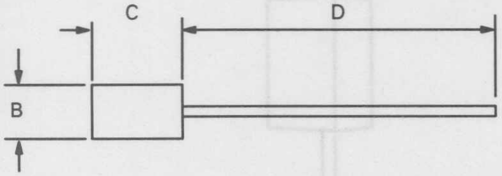
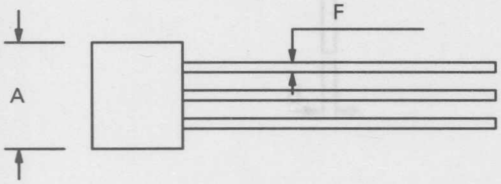
TO126 4-5

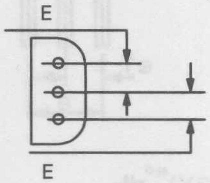
E-Line Package Dimensions

3 Pin Device

DIM	Millimeters		Inches	
	Min	Max	Min	Max
A	4.37	4.77	0.172	0.188
B	2.16	2.41	0.085	0.095
C	3.61	4.01	0.142	0.158
D	13.00	13.97	0.512	0.550
E	NOM 1.27		NOM 0.05	
F	0.37	0.495	0.016	0.0195





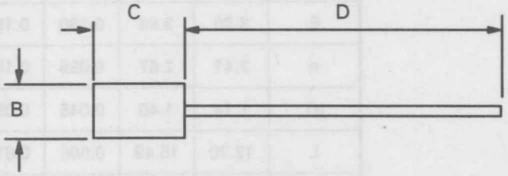


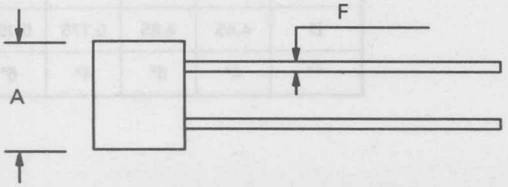
Leads to pass through a hole 0.7mm dia.

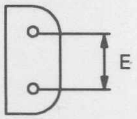
Various lead forms are offered, details of which are available on request.

2 Pin Device

DIM	Millimeters		Inches	
	Min	Max	Min	Max
A	4.37	4.77	0.172	0.188
B	2.16	2.41	0.085	0.095
C	3.61	4.01	0.142	0.158
D	13.00	13.97	0.512	0.550
E	NOM 2.54		NOM 0.10	
F	0.37	0.495	0.016	0.0195

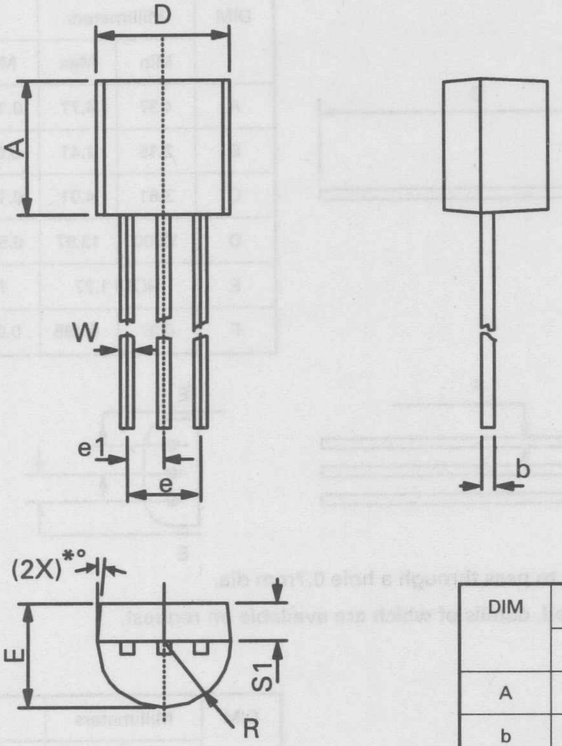






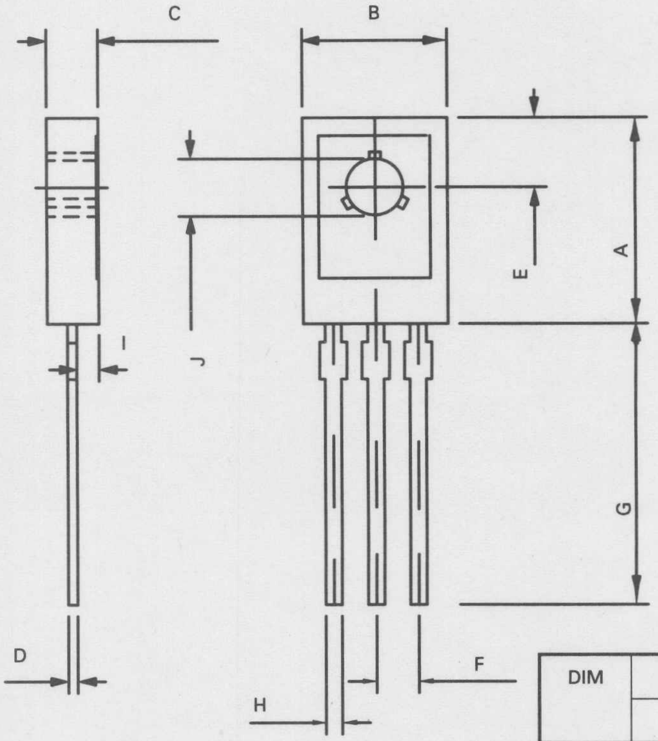
Leads to pass through a hole 0.7mm dia.

TO92 Package Dimensions



DIM	Millimeters		Inches	
	Min	Max	Min	Max
A	4.32	4.95	0.170	0.195
b	0.36	0.51	0.014	0.020
E	3.30	3.94	0.130	0.155
e	2.41	2.67	0.095	0.105
e1	1.14	1.40	0.045	0.055
L	12.70	15.49	0.500	0.610
R	2.16	2.41	0.085	0.095
S1	1.14	1.52	0.045	0.060
W	0.41	0.56	0.016	0.022
D	4.45	4.95	0.175	0.195
*°	4°	6°	4°	6°

TO126 Package Dimensions



DIM	Millimeters	
	Min	Max
A		11.1
B		7.80
C		2.80
D	0.50 typical	
E	3.75 typical	
F	2.29 typical	
G	15.3	
H		0.88
I	1.2 typical	
J	3.00	3.20

Tape and Reel Specifications

Page

E-Line (TO92 Style) 5-3

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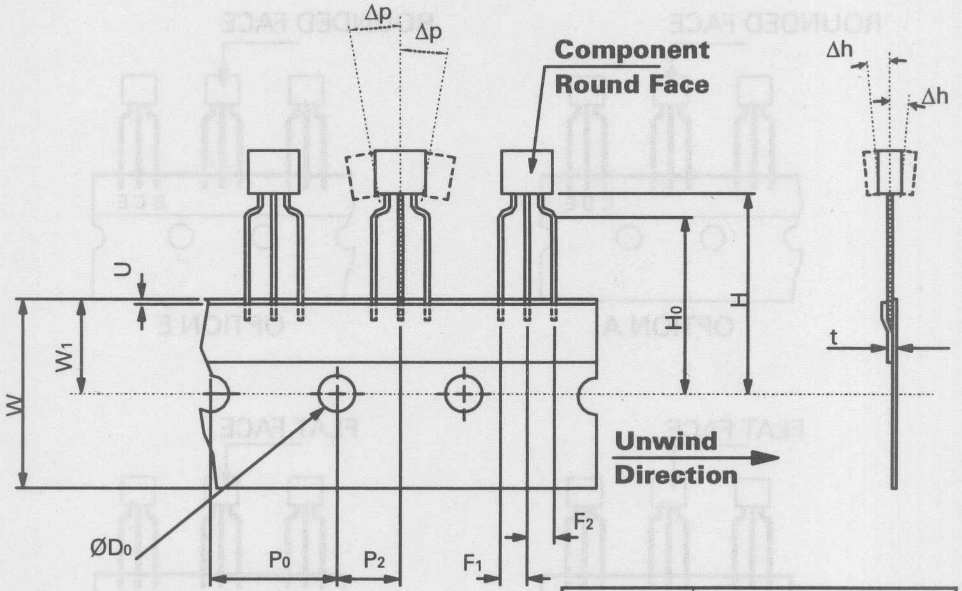
E-Line Tape and Reel Specification

Tape Specification



Notes:

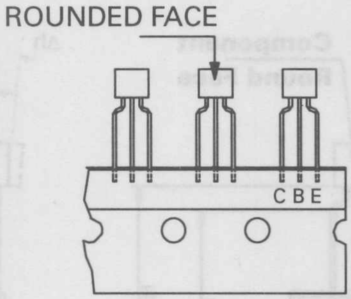
1. There will be a minimum of 5 pitches clear of devices at the start and end of the tape.

2. There will be no more than 3 consecutive spaces on the tape

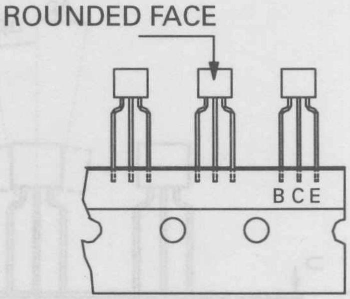
DIM	Millimeters	
	Min	Max
$ØD_0$	3.8	4.2
P_0	12.4	13.0
P_2	5.95	6.75
F_1 & F_2	2.44	2.94
H	18.0	20.0
Δh	-2.0	+ 2.0
Δp	-1.0	+ 1.0
H_0	15.5	16.5
W	17.5	19.0
W_1	8.5	9.5
u		0.5
t		0.9

E-Line Tape and Reel Specification

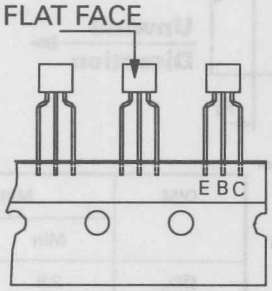
Taping Orientations



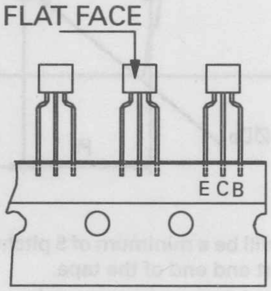
OPTION A



OPTION E



OPTION B



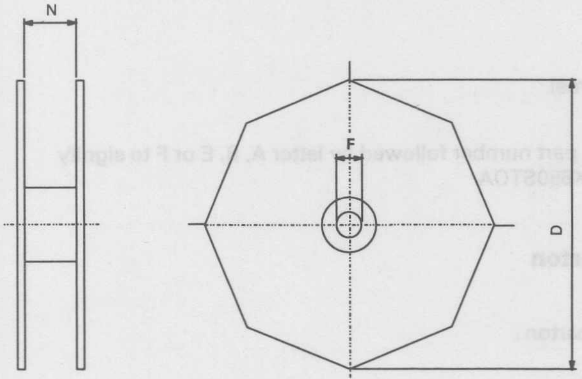
OPTION F

Note

For MOSFET pinout substitute C=D, B=G, E=S

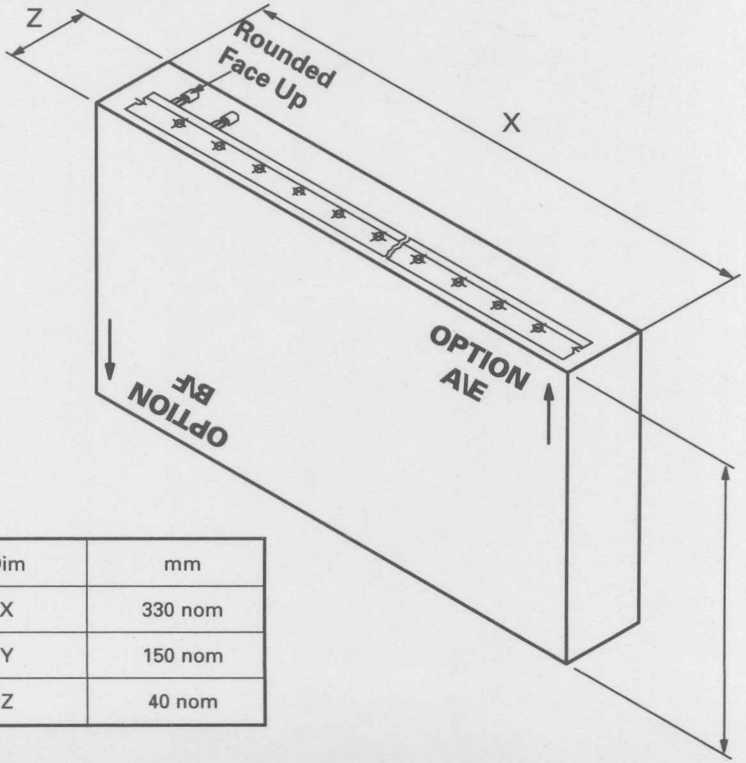
E-Line Tape and Reel Specification

Reel Specification



Dim	mm
D	320 nom
F	30 nom
N	36 nom

Carton Specification



Dim	mm
X	330 nom
Y	150 nom
Z	40 nom

E-Line Tape and Reel Specification

Tape on Reels

- 2000 devices per reel

- Add suffix STO to part number followed by letter A, B, E or F to signify orientation, eg ZTX650STOA

Tape in (Concertina Style) Carton

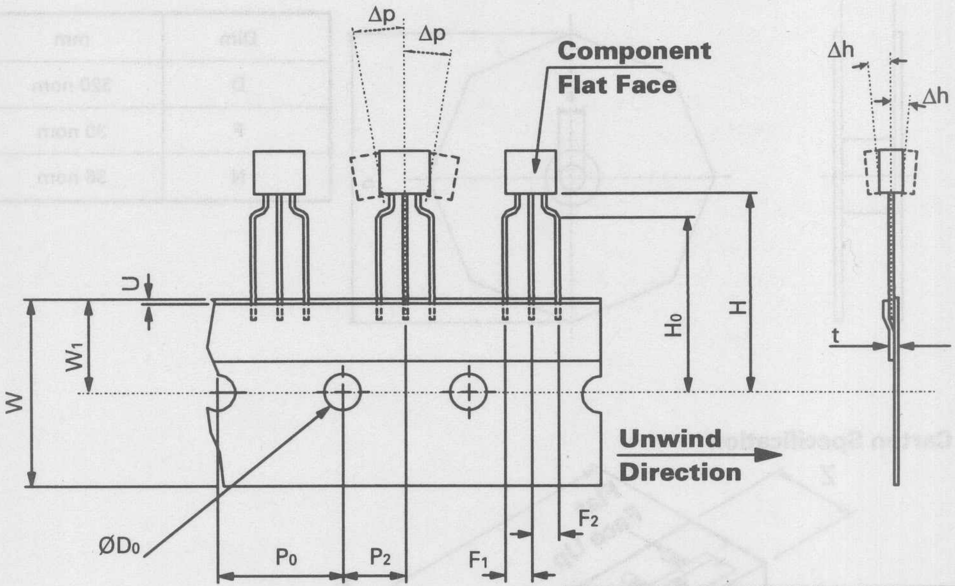
- 2000 devices per carton

- Add suffix STZ to part number, eg ZTX650STZ

- Orientation is determined by which end of the carton the tape is fed from.

TO92 Tape and Reel Specification

Tape Specification



Notes:

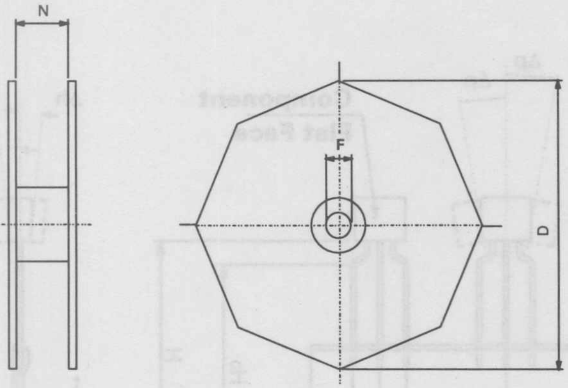
1. There will be a minimum of 5 pitches clear of devices at the start and end of the tape.

2. There will be no more than 3 consecutive spaces on the tape

DIM	Millimeters	
	Min	Max
$ØD_0$	3.8	4.2
P_0	12.4	13.0
P_2	5.95	6.75
F_1 & F_2	2.44	2.94
H	18.0	20.0
Δh	-2.0	+ 2.0
Δp	-1.0	+ 1.0
H_0	15.5	16.5
W	17.5	19.0
W_1	8.5	9.5
u		0.5
t		0.9

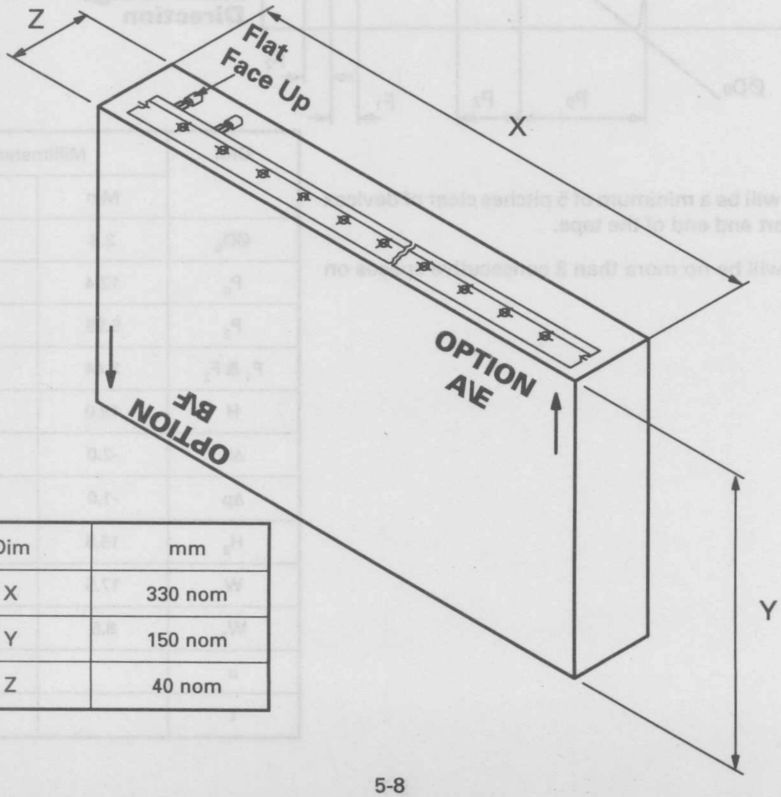
TO92 Tape and Reel Specification

Reel Specification



Dim	mm
D	320 nom
F	30 nom
N	36 nom

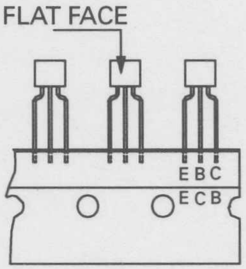
Carton Specification



Dim	mm
X	330 nom
Y	150 nom
Z	40 nom

TO92 Tape and Reel Specification

Taping Orientations



OPTION B

Ordering Information

Tape on Reels

- 1500 devices per reel
- Add suffix STOB to part number, eg BC372STOB

Tape in (Concertina Style) Carton

- 1500 devices per carton
- Add suffix STZ to part number, eg BC372STZ
- Orientation is determined by which end of the carton the tape is fed from.

Surface Mount Alternatives

Page

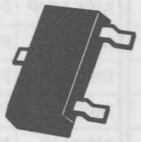
Packages Available 6-3

Alternative List 6-4

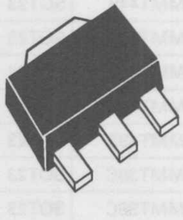
Surface Mount Alternatives

Surface Mount Packages

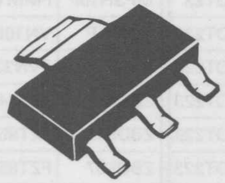
In addition to the packages outlined in this databook, Zetex offers a comprehensive range of surface mount devices, in the packages shown below:



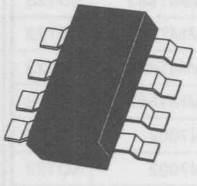
SOT23



SOT89



SOT223



SM-8

Further details on the devices offered in these packages are available on request.

Part No.	Surface Mount Part	Package
2N6517	FMMT6517	SOT23
2N6520	FMMT6520	SOT23
2N6714	FMMT449	SOT23
2N6715	FMMT491	SOT23
2N6716	FMMT491	SOT23
2N6717	FMMT493	SOT23
2N6718	FMMT493	SOT23
2N6724	FMMT38C	SOT23
2N6725	FMMT38C	SOT23
2N6726	FMMT589	SOT23
2N6727	FMMT591	SOT23
2N6728	FMMT591	SOT23
2N6729	FMMT593	SOT23
2N6730	FMMT593	SOT23
2N6731	FMMT493	SOT23
2N6732	FMMT593	SOT23
2N7000	2N7002	SOT23
2N7000P	2N7002	SOT23
BC368	FMMT449	SOT23
BC369	FMMT549	SOT23
BC372	FMMT614	SOT23
BC372P	FMMT614	SOT23
BC639	FMMT493	SOT23
BC640	FMMT593	SOT23
BCX38A	FMMT38A	SOT23
BCX38B	FMMT38B	SOT23
BCX38C	FMMT38C	SOT23
BS107P	ZVNL120G	SOT223
BS107PT	ZVNL120G	SOT223
BS170P	BS170F	SOT23
BS250P	BS250F	SOT23
FXT38C	FMMT38C	SOT23
FXT449	FMMT449	SOT23
FXT450	FMMT491	SOT23
FXT451	FMMT491	SOT23
FXT453	FMMT493	SOT23
FXT455	FMMT495	SOT23
FXT458	FMMT458	SOT23
FXT549	FMMT549	SOT23
FXT550	FMMT591	SOT23
FXT551	FMMT591	SOT23
FXT553	FMMT593	SOT23
FXT555	FMMT596	SOT23
FXT557	FMMT597	SOT23
FXT601B	FZT601B	SOT223
FXT603	FZT604	SOT223
FXT605	FZT605	SOT223
FXT614	FMMT614	SOT23
FXT649	FZT649	SOT223
FXT651	FZT651	SOT223
FXT653	FZT653	SOT223
FXT655	FZT655	SOT223
FXT657	FZT657	SOT223
FXT688B	FZT688B	SOT223
FXT690B	FZT690B	SOT223
FXT704	FZT704	SOT223
FXT705	FZT705	SOT223
FXT749	FZT749	SOT223
FXT751	FZT751	SOT223
FXT753	FZT753	SOT223
FXT755	FZT755	SOT223
FXT757	FZT757	SOT223
FXT788B	FZT788B	SOT223
FXT790A	FZT790A	SOT223
FXTA42	FMMTA42	SOT23
FXTA92	FMMTA92	SOT23
MPS2222A	FMMT2222A	SOT23
MPS2369A	FMMT2369A	SOT23
MPS2907A	FMMT2907A	SOT23
MPS5179	FMMT5179	SOT23
MPS6601	FMMT449	SOT23
MPS6651	FMMT549	SOT23
MPSA06	FMMTA06	SOT23
MPSA12P	FMMTA12	SOT23
MPSA42	FMMTA42	SOT23
MPSA44	FZT658	SOT223
MPSA56	FMMTA56	SOT23
MPSA77	BCV46	SOT23
MPSA77P	BCV46	SOT23
MPSA92	FMMTA92	SOT23
MPSA94	FMMT558	SOT23
MPSH10	FMMTH10	SOT23
MPSH10P	FMMTH10	SOT23
VN10LP	VN10LF	SOT23
VN2222LL	ZVN3306F	SOT23
ZBD849	FZT849	SOT223
ZBD853	FZT853	SOT223
ZBD857	FZT857	SOT223
ZBD949	FZT949	SOT223
ZBD953	FZT953	SOT223
ZBD957	FZT957	SOT223
ZC744	REFER	-
ZC820/A/B	ZC830/A/B	SOT23
ZC821/A/B	ZC831/A/B	SOT23
ZC822/A/B	ZC832/A/B	SOT23
ZC823/A/B	ZC833/A/B	SOT23
ZC824/A/B	ZC834/A/B	SOT23
ZC825/A/B	ZC835/A/B	SOT23
ZC826/A/B	ZC836/A/B	SOT23
ZC2800	ZC2800E	SOT23
ZC2811	ZC2811E	SOT23
ZC5800	ZC5800E	SOT23
ZCN0545A	REFER	
ZCN9150A	REFER	
ZDX1F	REFER	

Surface Mount Alternatives

Part No.	Surface Mount Part	Package
ZDX1R	REFER	
ZDX2F	REFER	
ZDX2R	REFER	
ZDX3F	REFER	
ZDX3R	REFER	
ZDX4F	REFER	
ZDX4R	REFER	
ZDX5	REFER	
ZDX6	REFER	
ZR431C	ZR431G	SOT223
ZRA124A	ZRA124F	SOT23.
ZRA124Y	ZRA124F	SOT23.
ZRA125A	ZRA125F	SOT23.
ZRA125Y	ZRA125F	SOT23.
ZRA245A	ZRA245F	SOT23.
ZRA245Y	ZRA245F	SOT23.
ZRA250A	ZRA250F	SOT23.
ZRA250Y	ZRA250F	SOT23.
ZRA400A	ZRA400F	SOT23.
ZRA400Y	ZRA400F	SOT23.
ZRB500A	ZRB500F	SOT23.
ZRB500Y	ZRB500F	SOT23.
ZRC330A	ZRC330F	SOT23.
ZRC330Y	ZRC330F	SOT23.
ZSR330C	ZSR330G	SOT223
ZSR500C	ZSR500G	SOT223
ZSR600C	ZSR600G	SOT223
ZSR800C	ZSR800G	SOT223
ZSR1000C	ZSR1000G	SOT223
ZTX214C	BC860C	SOT23.
ZTX300	BCW60B	SOT23.
ZTX314	FMMT2369A	SOT23.
ZTX320	FMMT918	SOT23.
ZTX321	FMMT918	SOT23.
ZTX322	BFQ31	SOT23.
ZTX323	BFQ31A	SOT23.
ZTX325	BFS17	SOT23.
ZTX337C	BCW65H	SOT23.
ZTX341	BCX41	SOT23.
ZTX360	REFER	
ZTX384C	BC859C	SOT23
ZTX413	REFER	
ZTX415	FMMT415	SOT23
ZTX449	FMMT449	SOT23
ZTX450	FMMT491	SOT23
ZTX451	FMMT491	SOT23
ZTX452	FMMT493	SOT23
ZTX453	FMMT493	SOT23
ZTX454	FMMT495	SOT23
ZTX455	FMMT495	SOT23
ZTX457	FMMT497	SOT23
ZTX458	FMMT458	SOT23
ZTX500	BCW61B	SOT23
ZTX510	BSS65	SOT23
ZTX537C	BCW68H	SOT23
ZTX541	HT3	SOT23
ZTX549	FMMT549	SOT23
ZTX549A	FMMT549A	SOT23
ZTX550	FMMT591	SOT23
ZTX551	FMMT591	SOT23
ZTX552	FMMT593	SOT23
ZTX553	FMMT593	SOT23
ZTX554	FMMT593	SOT23
ZTX555	FMMT596	SOT23
ZTX556	FMMT596	SOT23
ZTX557	FMMT597	SOT23
ZTX558	FMMT558	SOT23
ZTX576	FMMT596	SOT23
ZTX600	FZT601B	SOT223
ZTX600A	FZT601B	SOT223
ZTX600B	FZT601B	SOT223
ZTX601	FZT601B	SOT223
ZTX601A	FZT601B	SOT223
ZTX601B	FZT601B	SOT223
ZTX602	FZT603	SOT223
ZTX603	FZT603	SOT223
ZTX604	FZT604	SOT223
ZTX605	FZT605	SOT223
ZTX614	FMMT614	SOT23
ZTX649	FZT649	SOT223
ZTX650	FZT651	SOT223
ZTX651	FZT651	SOT223
ZTX652	FZT653	SOT223
ZTX653	FZT653	SOT223
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ZTX655	FZT655	SOT223
ZTX656	FZT657	SOT223
ZTX657	FZT657	SOT223
ZTX658	FZT658	SOT223
ZTX688B	FZT688B	SOT223
ZTX689B	FZT689B	SOT223
ZTX690B	FZT690B	SOT223
ZTX692B	FZT692B	SOT223
ZTX694B	FZT694B	SOT223
ZTX696B	FZT696B	SOT223
ZTX704	FZT705	SOT223
ZTX705	FZT705	SOT223
ZTX712	BCV46	SOT223
ZTX749	FZT749	SOT223
ZTX750	FZT751	SOT223
ZTX751	FZT751	SOT223
ZTX752	FZT753	SOT223
ZTX753	FZT753	SOT223
ZTX754	FZT755	SOT223
ZTX755	FZT755	SOT223
ZTX756	FZT757	SOT223
ZTX757	FZT757	SOT223
ZTX758	FZT758	SOT223
ZTX776	REFER	
ZTX788A	REFER	
ZTX788B	FZT788B	SOT223

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Part No.	Surface Mount Part	Package
ZTX789A	FZT789A	SOT223
ZTX790A	FZT790A	SOT223
ZTX792A	FZT792A	SOT223
ZTX795A	FZT795A	SOT223
ZTX796A	FZT796A	SOT223
ZTX849	FZT849	SOT223
ZTX851	FZT851	SOT223
ZTX853	FZT853	SOT223
ZTX855	FZT855	SOT223
ZTX857	FZT857	SOT223
ZTX869	FZT869	SOT223
ZTX948	FZT948	SOT223
ZTX949	FZT949	SOT223
ZTX951	FZT951	SOT223
ZTX953	FZT953	SOT223
ZTX955	FZT955	SOT223
ZTX956	FZT956	SOT223
ZTX957	FZT957	SOT223
ZTX958	FZT958	SOT223
ZTX968	FZT968	SOT223
ZTX1047A	REFER	
ZTX1048A	REFER	
ZTX1049A	REFER	
ZTX1051A	REFER	
ZTX1053A	REFER	
ZTX1055A	REFER	
ZTX1056A	REFER	
ZVN0120A	ZVNL120G	SOT223
ZVN0124A	ZVNL120G	SOT223
ZVN0535A	REFER	
ZVN0540A	ZVN0545G	SOT223
ZVN0545A	ZVN0545G	SOT223
ZVN1409A	REFER	
ZVN2106A	ZVN2106G	SOT223
ZVN2110A	ZVN2110G	SOT223
ZVN2110C	ZVN2110G	SOT223
ZVN2120A	ZVNL120G	SOT223

Part No.	Surface Mount Part	Package
ZVN2120C	ZVNL120G	SOT223
ZVN2535A	ZVNL120G	SOT223
ZVN3306A	ZVN3306F	SOT23
ZVN3310A	ZVN3310F	SOT23
ZVN4206A	ZVN4206G	SOT223
ZVN4206C	ZVN4206G	SOT223
ZVN4210A	ZVN4210G	SOT223
ZVN4306A	ZVN4306G	SOT223
ZVN4310A	ZVN4310G	SOT223
ZVN4424A	ZVN4424G	SOT223
ZVN4424C	ZVN4424G	SOT223
ZVNL110A	ZVNL110G	SOT223
ZVNL120A	ZVNL120G	SOT223
ZVNL120C	ZVNL120G	SOT223
ZVNL535A	REFER	
ZVP0120A	ZVP2120G	SOT223
ZVP0535A	REFER	
ZVP0540A	REFER	
ZVP0545A	REFER	
ZVP1320A	ZVP1320F	SOT23
ZVP2106A	ZVP2106G	SOT223
ZVP2106C	ZVP2106G	SOT223
ZVP2110A	ZVP2110G	SOT223
ZVP2110C	ZVP2110G	SOT223
ZVP2120A	ZVP2120G	SOT223
ZVP2120C	ZVP2120G	SOT223
ZVP3306A	ZVP3306F	SOT23
ZVP3310A	ZVP3310F	SOT23
ZVP4105A	BSS84	SOT23
ZVP4424A	ZVP4424G	SOT223
ZVP4424C	ZVP4424G	SOT223

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